0790

PB 204 147

COMPUTER MAPPING
as an aid in
AIR POLLUTION STUDIES

VOLUME ONE: SUMMARY REPORT

APPENDIX: COMPUTER GRAPHICS

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16. Abstracts

An appendix which contains a complete set of all graphics shown in volume I and volume II of a study of computer mapping as applied to air pollution studies.

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Computer programs
Mapping
Graphic methods

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 13B

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April 1970

COMPUTER MAPPING

as an aid in

AIR POLLUTION STUDIES

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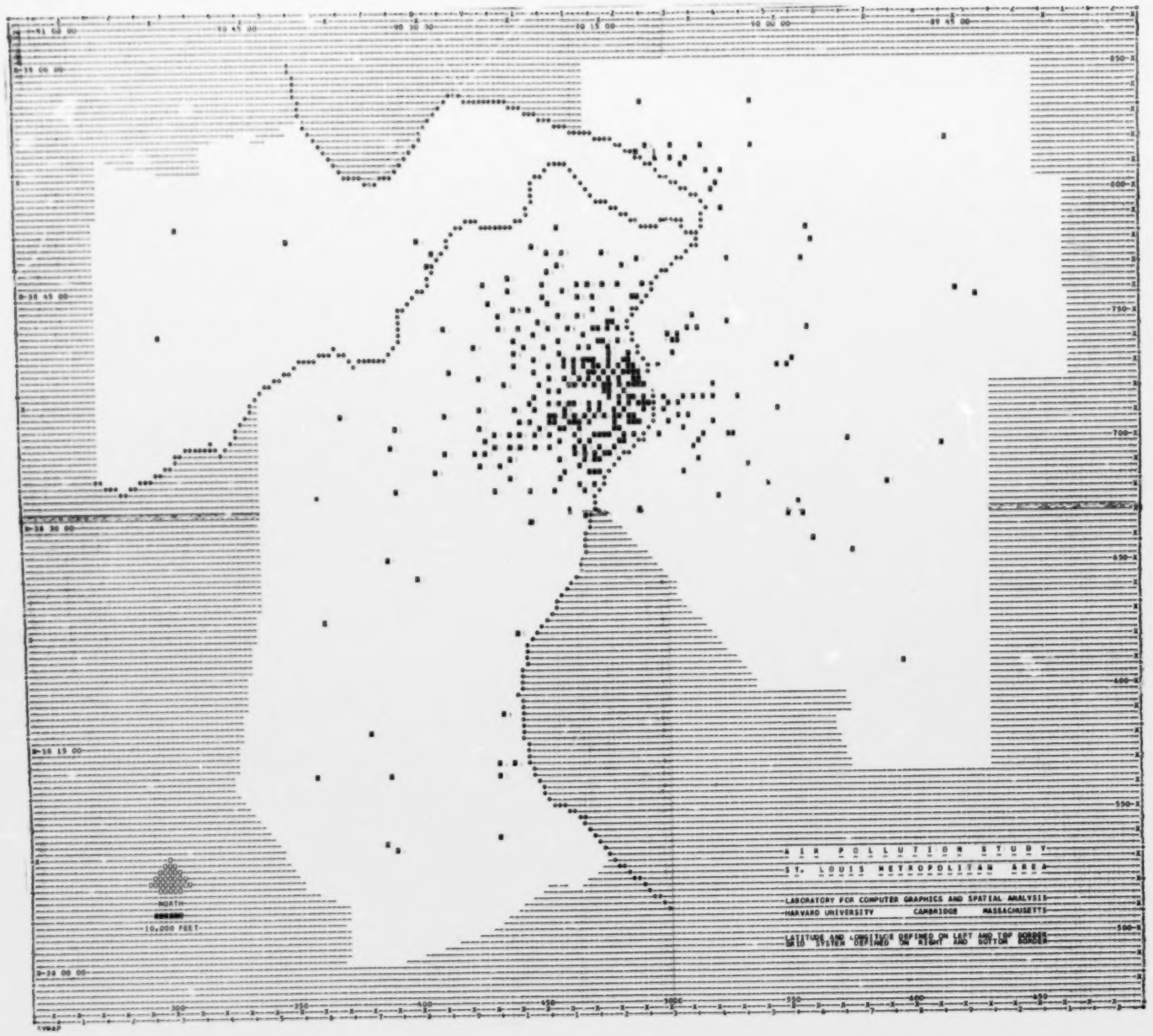


FIGURE A-1

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Census Tract Centers

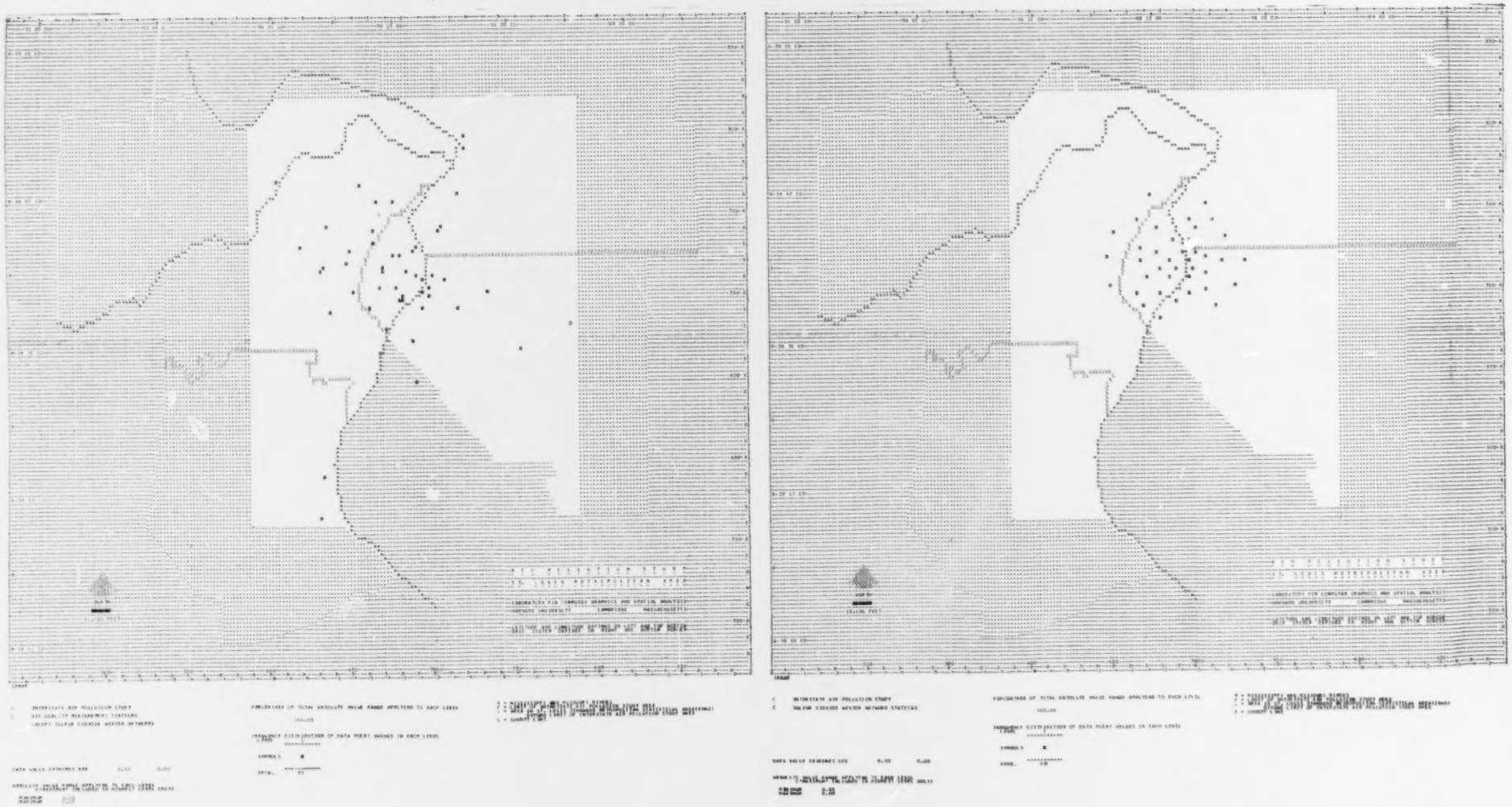


FIGURE A-2

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Measurement Stations — Winter Network — 1963-64
a. Except Sulfur Dioxide b. Sulfur Dioxide

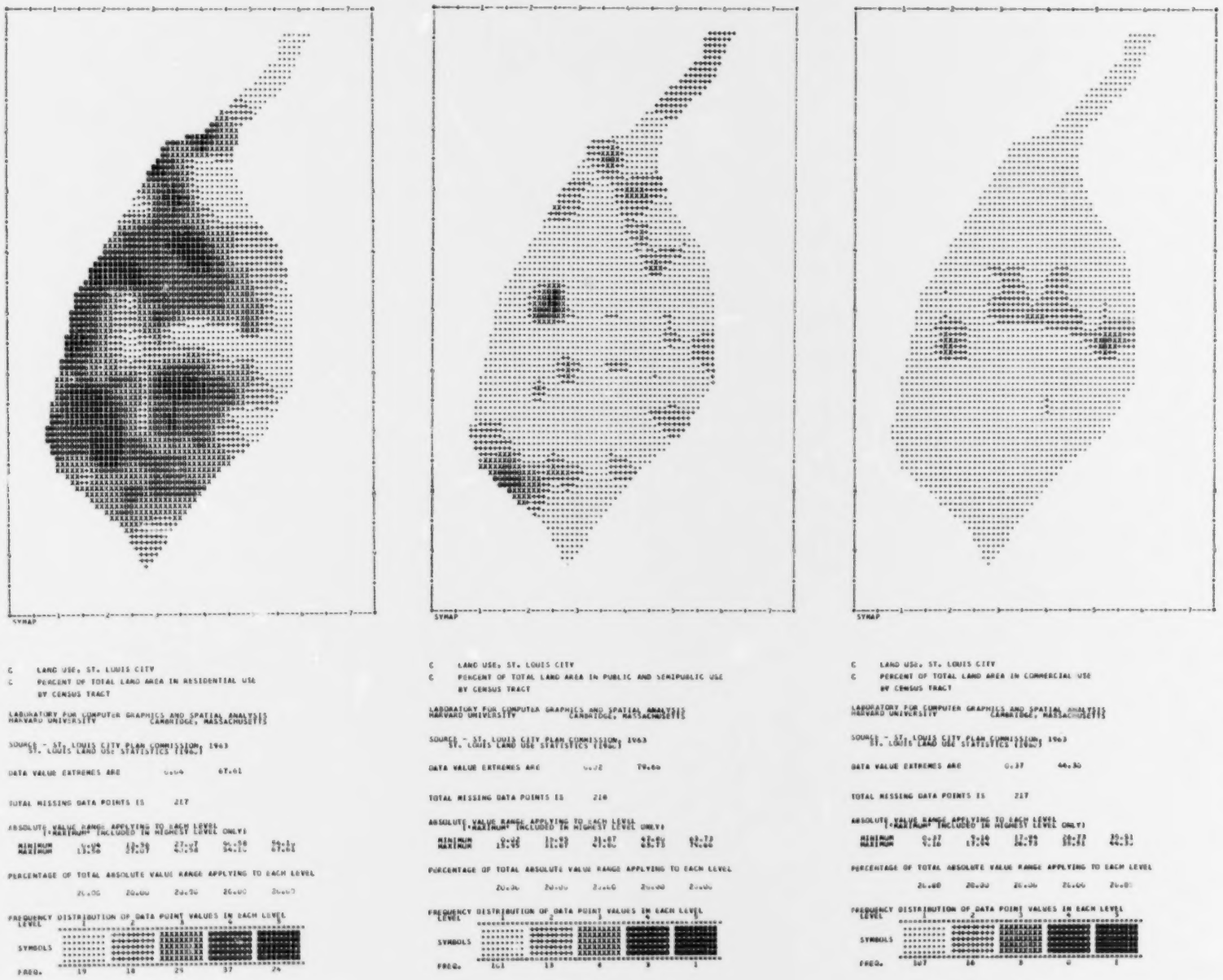


FIGURE A-3

ST. LOUIS REGION STUDY

St. Louis City — Land Use Maps

a. Percent Land Area in Residential Use

b. Percent Land Area in Public and Semipublic Use

c. Percent of Land Area in Commercial Use

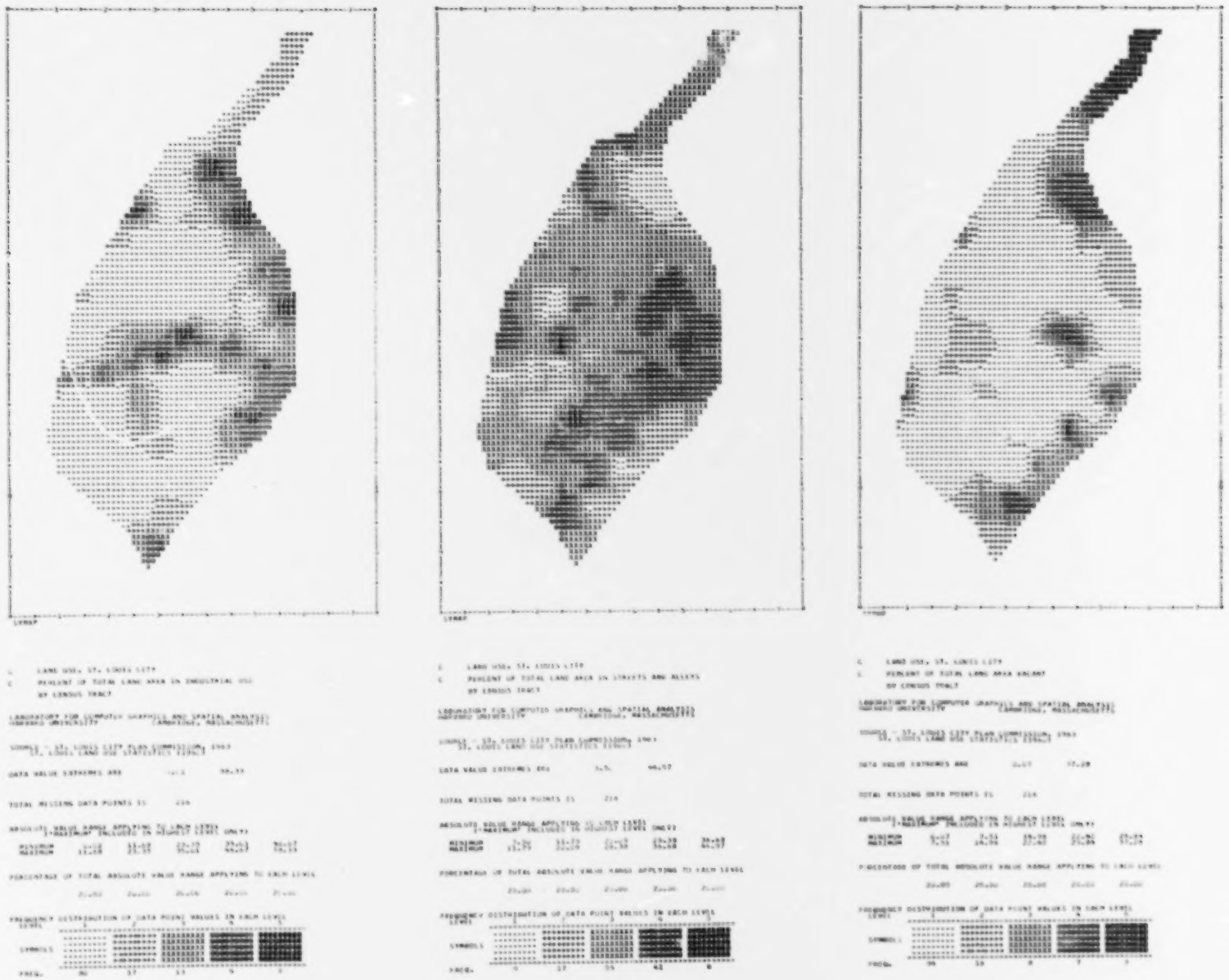


FIGURE A-4

ST. LOUIS REGION STUDY
St. Louis City -- Land Use Maps
a. Percent Land Area in Industrial Use
b. Percent Land Area in Streets and Alleys
c. Percent Land Area Vacant

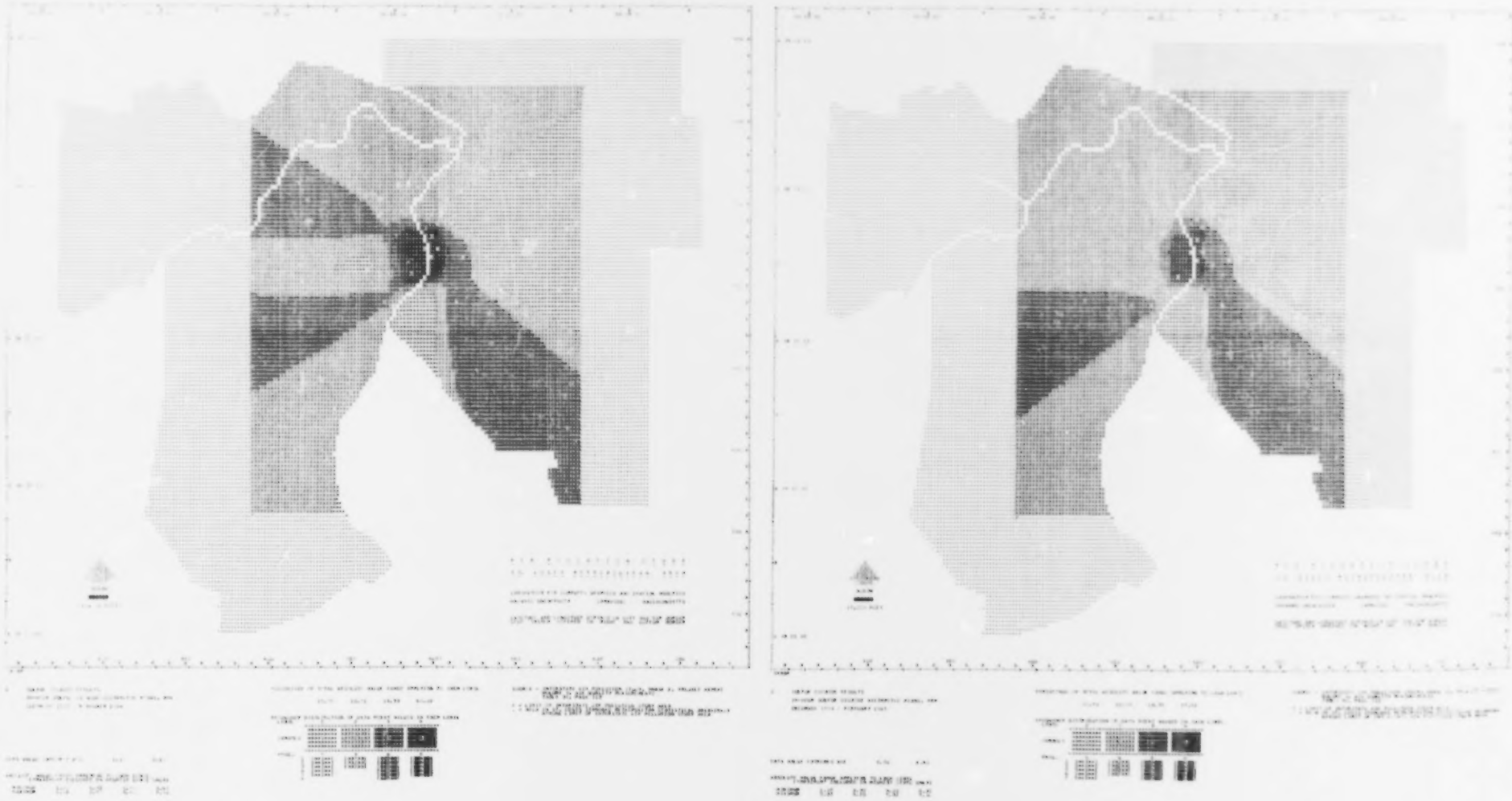


FIGURE A-5

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
24-hour SO_2 Readings — 19-Station Network
a. Arithmetic Means, Winter 1963-64
b. Arithmetic Means, Winter 1964-65

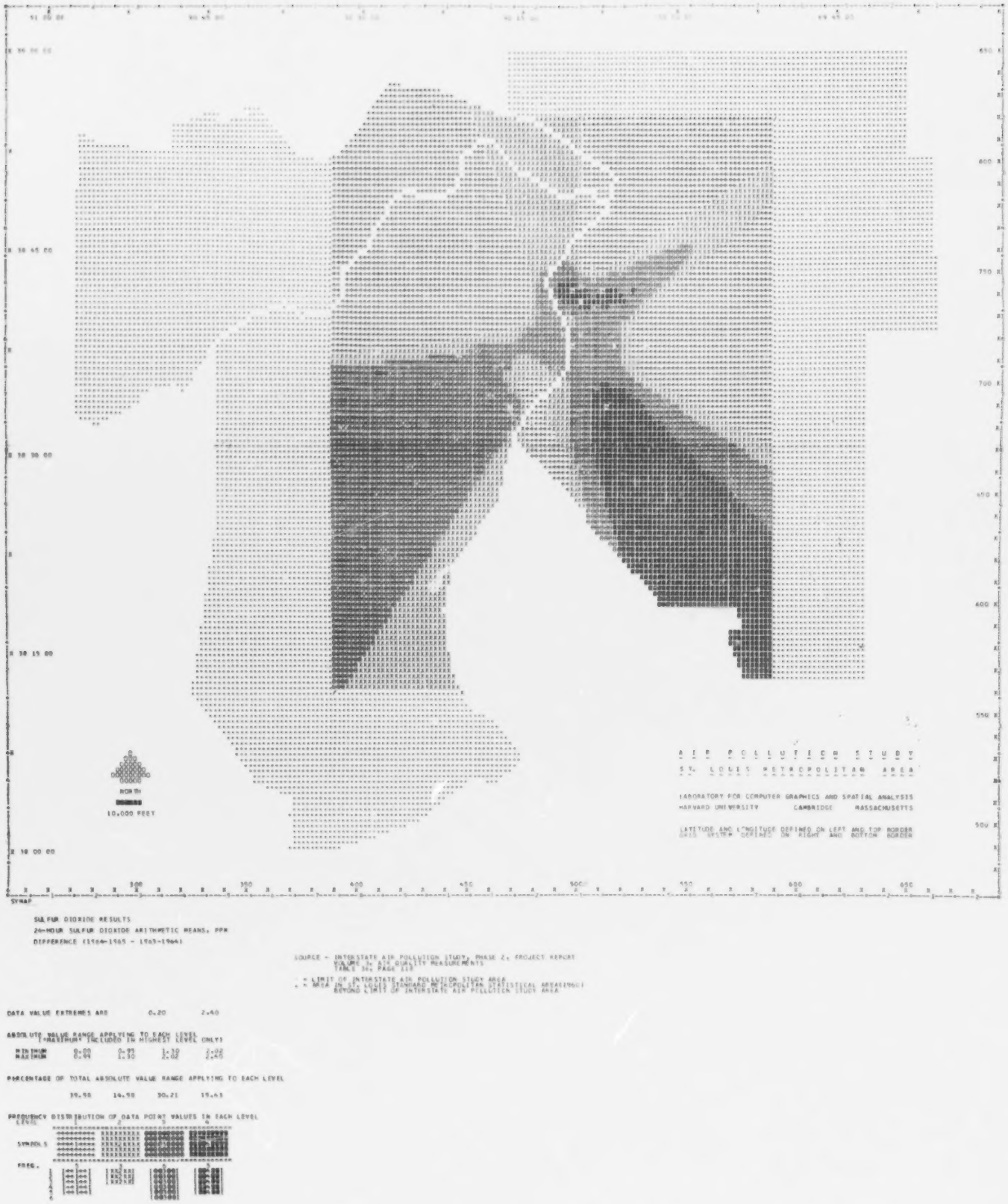
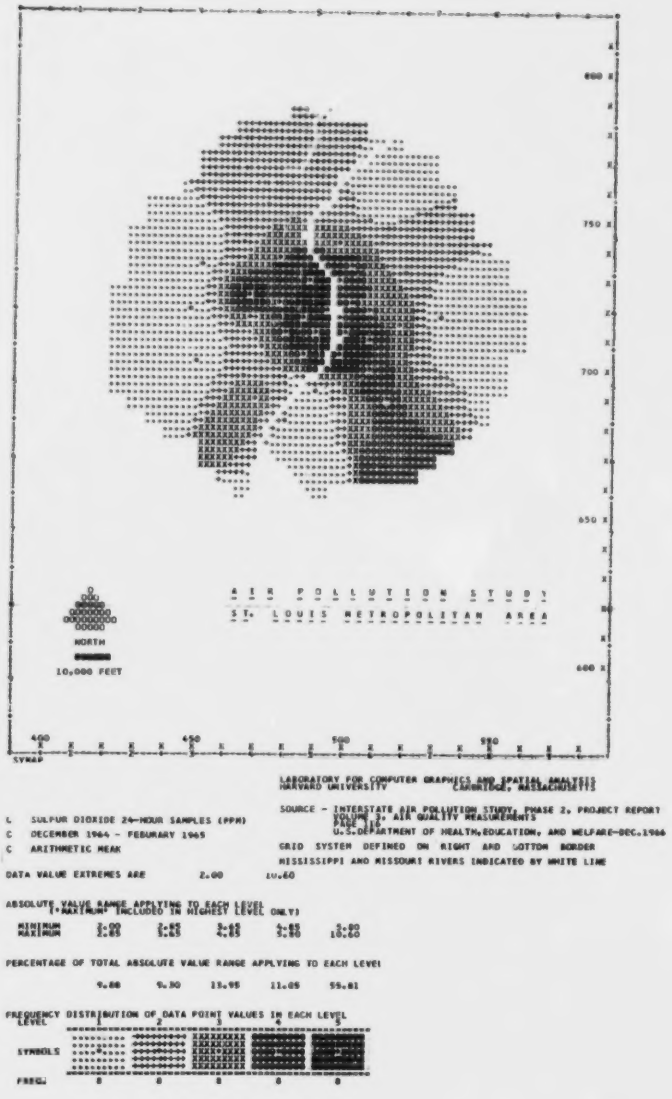


FIGURE A-6

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Differences between A-5a. and b.



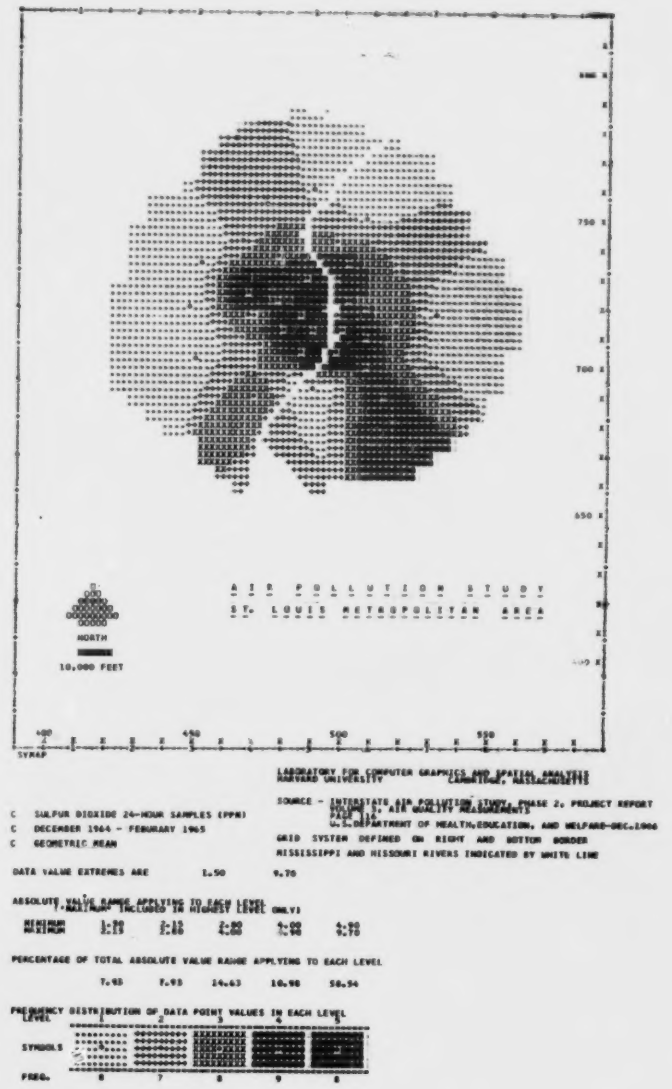


FIGURE A-7

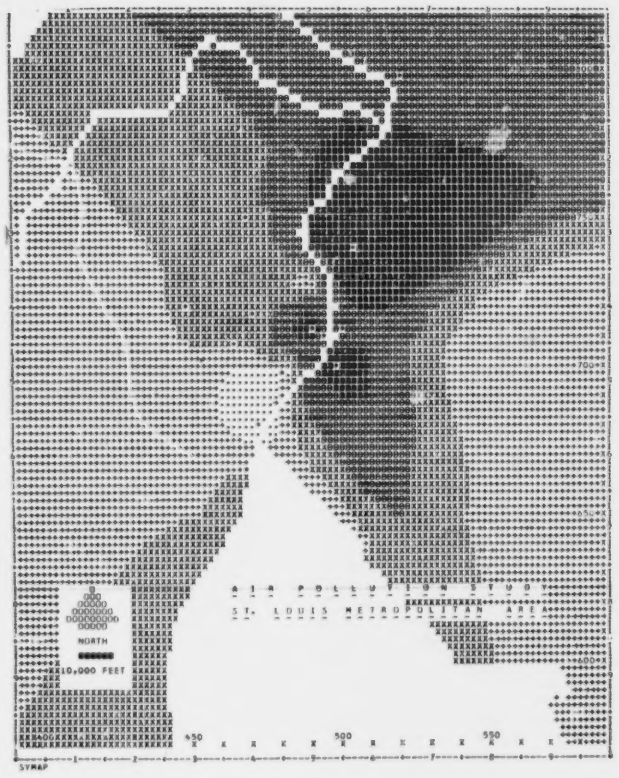
ST. LOUIS REGION STUDY

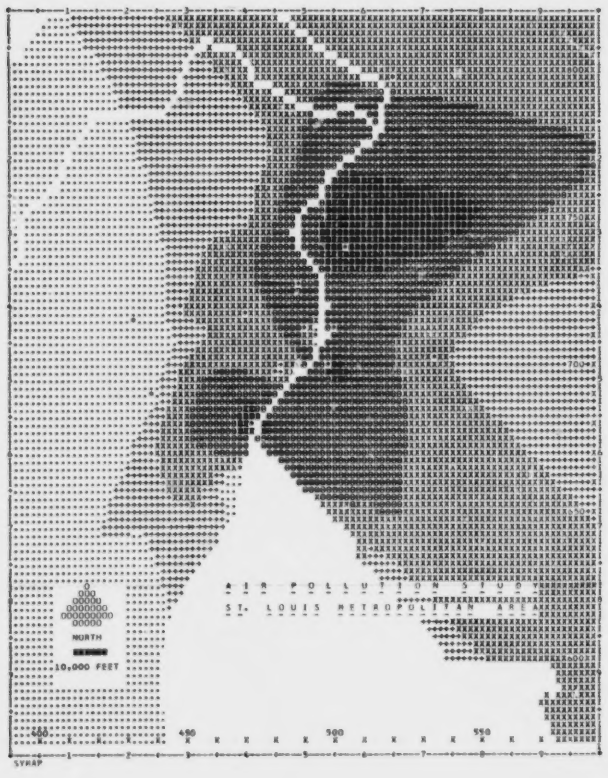
St. Louis Interstate Air Pollution Study Area

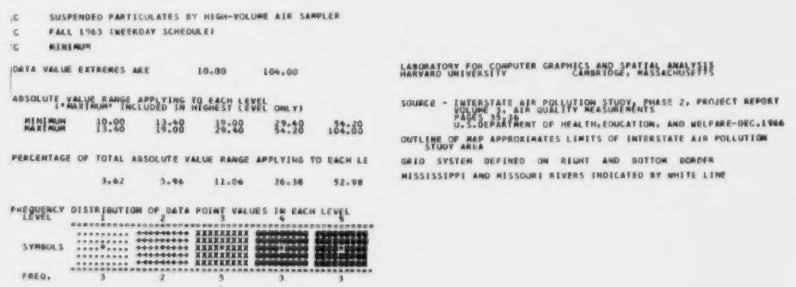
24-hour SO_2 Readings — 40-Station Network

a. Arithmetic Means — Winter 1964-65

b. Geometric Means — Winter 1964-65







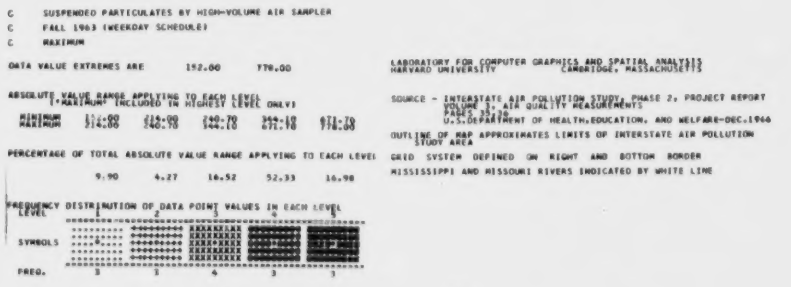
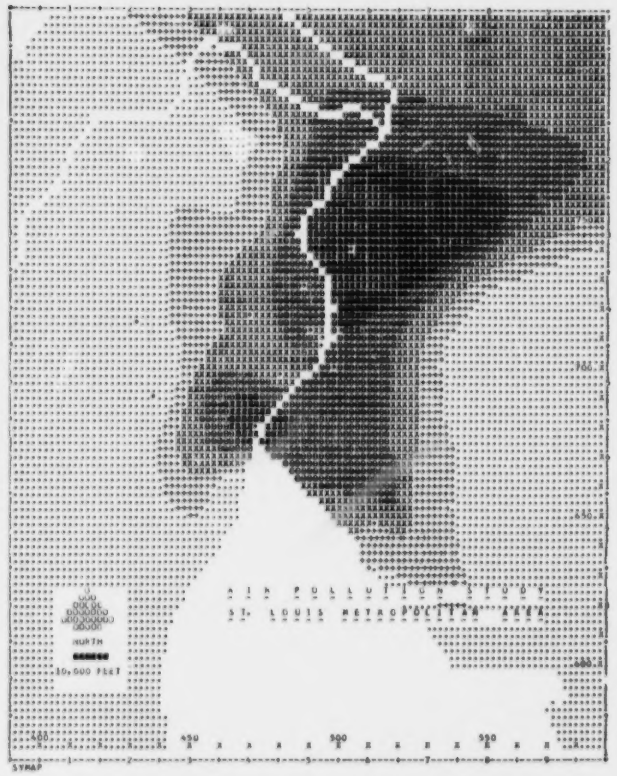
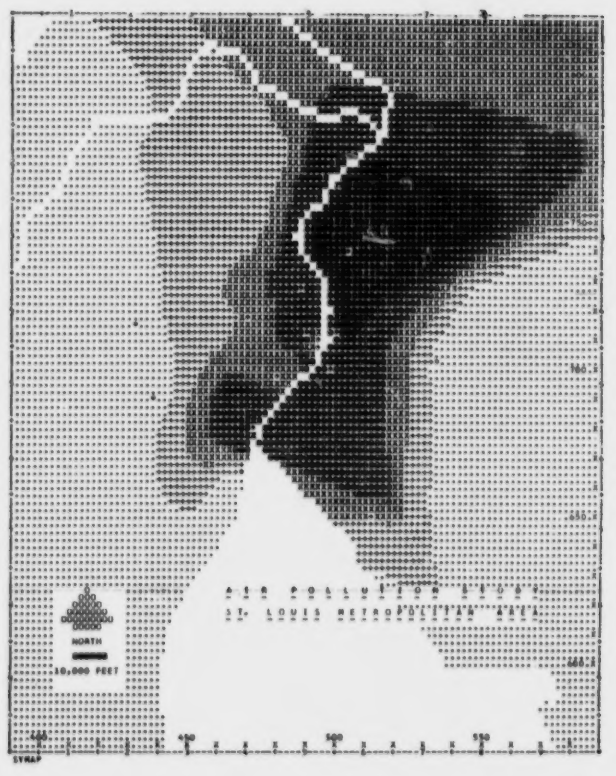
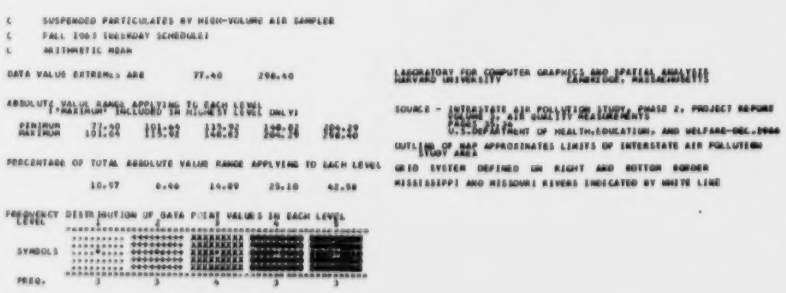


FIGURE A-8

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Suspended Particulates by High-Volume Air Sampler
Fall 1963 (Weekday Schedule)
a. Minimum b. Maximum







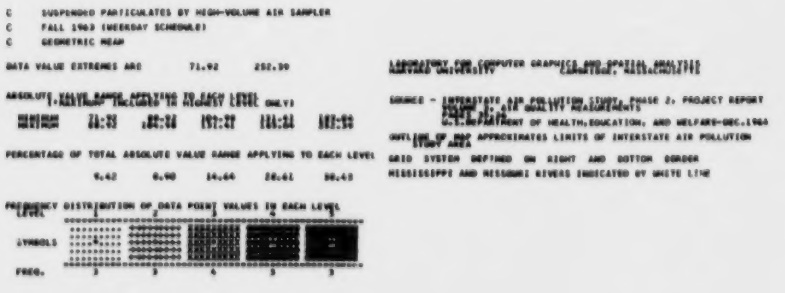
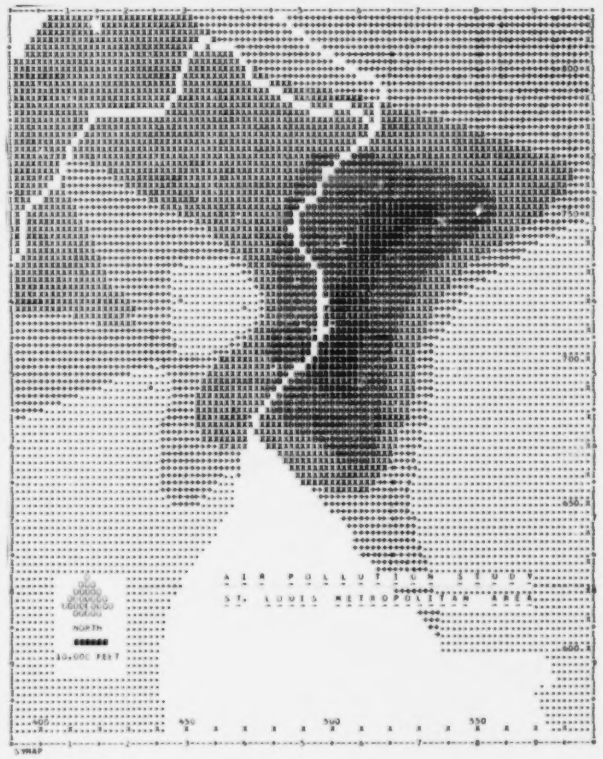


FIGURE A-9

ST. LOUIS REGION STUDY

St. Louis Interstate Air Pollution Study Area
Suspended Particulates by High-Volume Air Sampler
Fall 1963 (Weekday Schedule)

a. Arithmetic Mean b. Geometric Mean



C SUSPENDED PARTICULATES BY HIGH-VOLUME AIR SAMPLER
C WINTER 1963-1964 (WEEKDAY SCHEDULE)
C MINIMUM

DATA VALUE EXTREMES ARE 12.00 93.00

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
(*MAXIMUM* INCLUDED IN HIGHEST LEVEL ONLY)

	1	2	3	4	5
MINIMUM	12.00	25.50	47.70	59.50	71.30
MAXIMUM	24.40	35.70	46.90	71.30	93.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

1	2	3	4	5
15.31	6.54	20.74	30.62	26.79

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS					
FREQ.	3	3	4	3	3

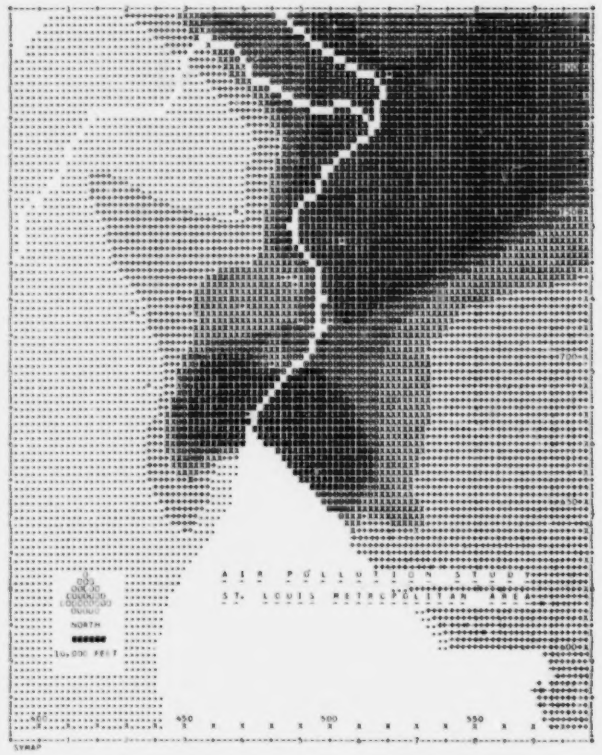
LABORATORY FOR COMPUTER GRAPHICS AND SPATIAL ANALYSIS
HARVARD UNIVERSITY CAMBRIDGE, MASSACHUSETTS

SOURCE - INTERSTATE AIR POLLUTION STUDY, PHASE 2, PROJECT REPORT VOLUME 2, AIR QUALITY MEASUREMENTS PAGES 25,26 U.S.DEPARTMENT OF HEALTH,EDUCATION, AND WELFARE-DEC.1966

OUTLINE OF MAP APPROXIMATES LIMITS OF INTERSTATE AIR POLLUTION STUDY AREA

GRID SYSTEM DEFINED ON RIGHT AND BOTTOM BORDER

MISSISSIPPI AND MISSOURI RIVERS INDICATED BY WHITE LINE



C SUSPENDED PARTICULATES BY HIGH-VOLUME AIR SAMPLER
C WINTER 1963-1964 (WEEKDAY SCHEDULE)
C MAXIMUM

DATA VALUE EXTREMES ARE 150.00 1337.00

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
(*MAXIMUM* INCLUDED IN HIGHEST LEVEL ONLY)

	1	2	3	4	5
MINIMUM	150.00	197.40	257.00	316.00	420.90
MAXIMUM	197.30	257.00	316.00	420.90	1337.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

1	2	3	4	5
3.90	9.04	6.97	8.04	77.10

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS					
FREQ.	3	3	4	3	3

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SOURCE - INTERSTATE AIR POLLUTION STUDY, PHASE 2, PROJECT REPORT VOLUME 2, AIR QUALITY MEASUREMENTS PAGES 25,26 U.S.DEPARTMENT OF HEALTH,EDUCATION, AND WELFARE-DEC.1966

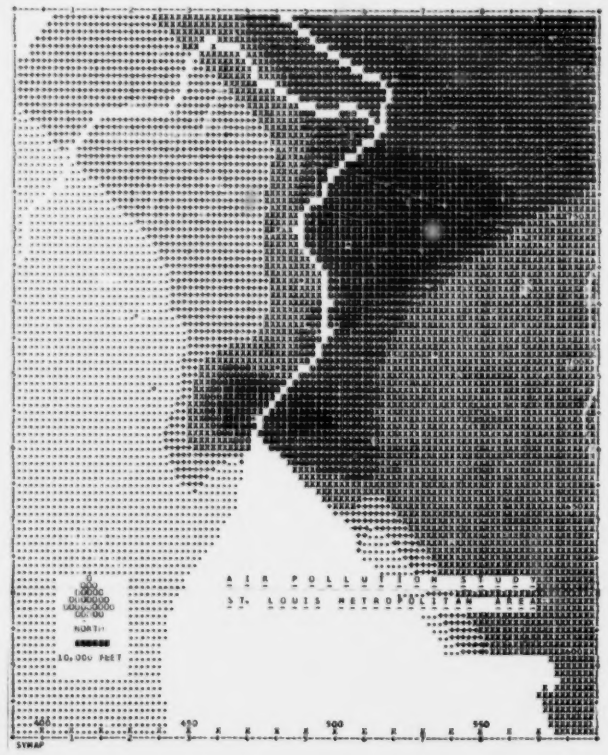
OUTLINE OF MAP APPROXIMATES LIMITS OF INTERSTATE AIR POLLUTION STUDY AREA

GRID SYSTEM DEFINED ON RIGHT AND BOTTOM BORDER

MISSISSIPPI AND MISSOURI RIVERS INDICATED BY WHITE LINE

FIGURE A-10

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Suspended Particulates by High-Volume Air Sampler
Winter 1963-64 (Weekday Schedule)
a. Minimum b. Maximum



C SUSPENDED PARTICULATES BY HIGH-VOLUME AIR SAMPLER
C WINTER 1963-1964 (WEEKDAY SCHEDULE)
C ARITHMETIC MEAN

DATA VALUE EXTREMES ARE 57.28 204.32

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
("MAXIMUM" INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM					
	92.16	130.46	169.39	196.58	185.68

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

8.29	10.74	18.40	16.02	46.55

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	.	:	+	E	E
FREQ.	3	3	4	3	3

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SOURCE - INTERSTATE AIR POLLUTION STUDY, PHASE 2, PROJECT REPORT
VOLUME I, AIR QUALITY MEASUREMENTS
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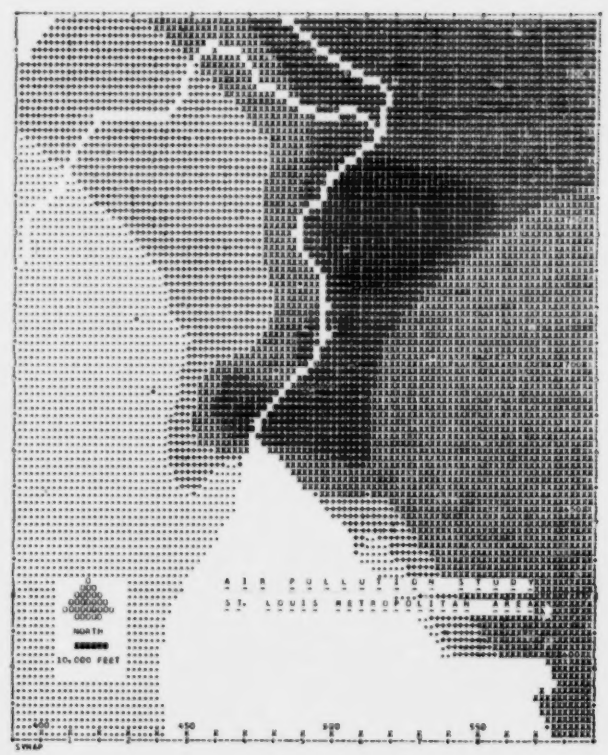
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE-DEC. 1966

OUTLINE OF MAP APPROXIMATES LIMITS OF INTERSTATE AIR POLLUTION STUDY AREA

GRID SYSTEM DEFINED ON RIGHT AND BOTTOM BORDER

MISSISSIPPI AND MISSOURI RIVERS INDICATED BY WHITE LINE



C SUSPENDED PARTICULATES BY HIGH-VOLUME AIR SAMPLER
C WINTER 1963-1964 (WEEKDAY SCHEDULE)
C GEOMETRIC MEAN

DATA VALUE EXTREMES ARE 52.16 206.57

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
("MAXIMUM" INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM					
	89.15	127.82	166.82	194.25	184.38

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

8.74	16.11	25.90	25.63	23.62

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS	.	:	+	E	E
FREQ.	3	3	4	5	5

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SOURCE - INTERSTATE AIR POLLUTION STUDY, PHASE 2, PROJECT REPORT
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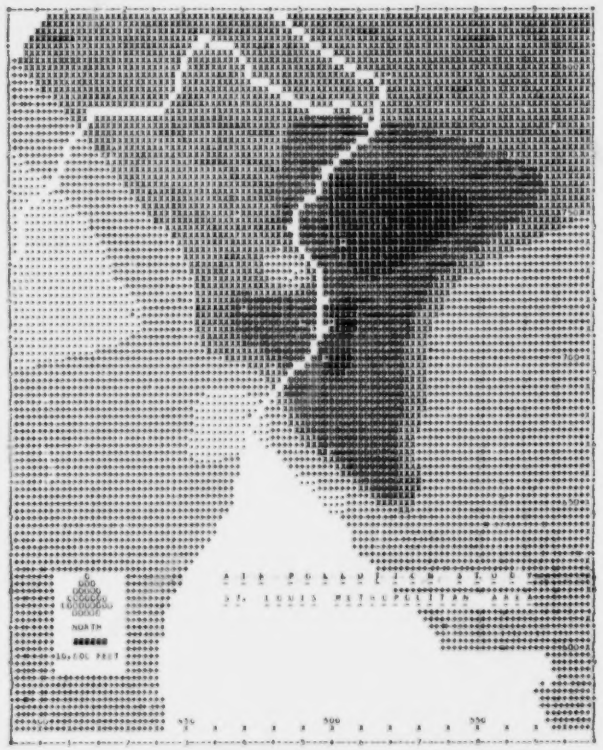
OUTLINE OF MAP APPROXIMATES LIMITS OF INTERSTATE AIR POLLUTION STUDY AREA

GRID SYSTEM DEFINED ON RIGHT AND BOTTOM BORDER

MISSISSIPPI AND MISSOURI RIVERS INDICATED BY WHITE LINE

FIGURE A-11

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Suspended Particulates by High-Volume Air Sampler
Winter 1963-64 (Weekday Schedule)
a. Arithmetic Mean b. Geometric Mean



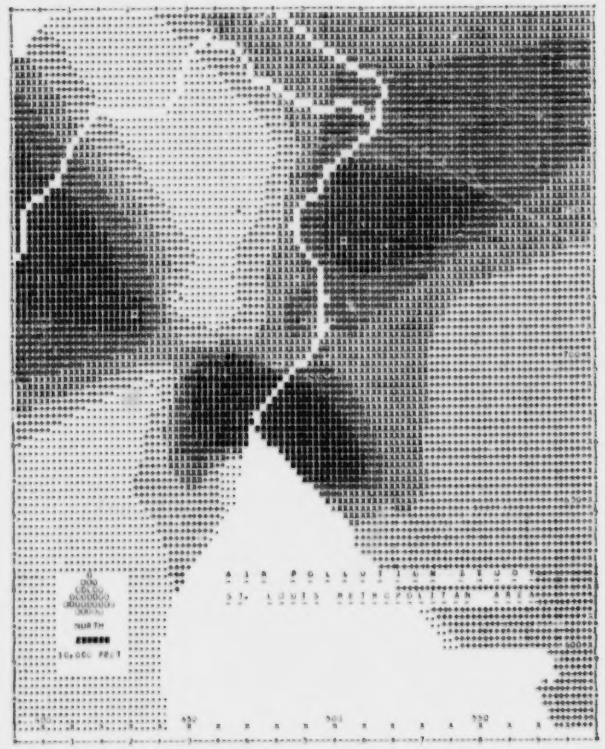


FIGURE A-12

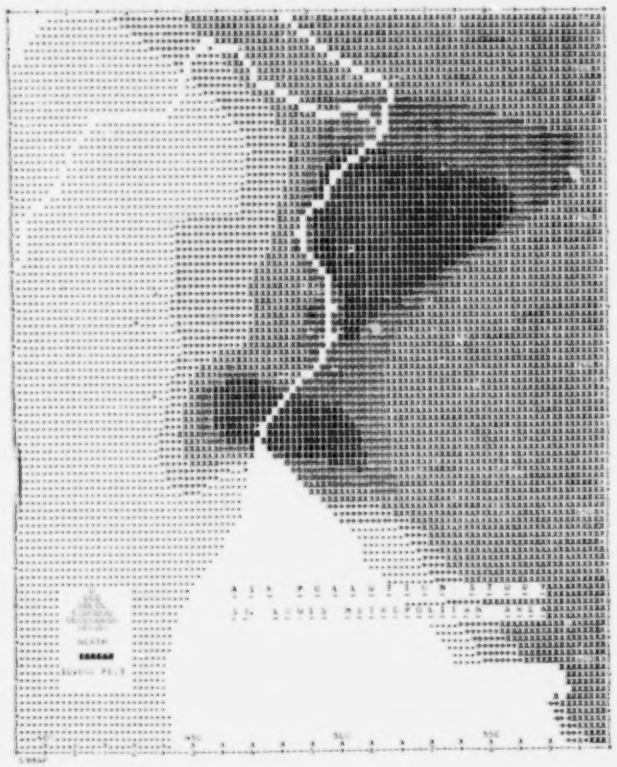
ST. LOUIS REGION STUDY

St. Louis Interstate Air Pollution Study Area

Suspended Particulates by High-Volume Air Sampler

July 1963-June 1964 (Random Schedule)

a. Minimum b. Maximum



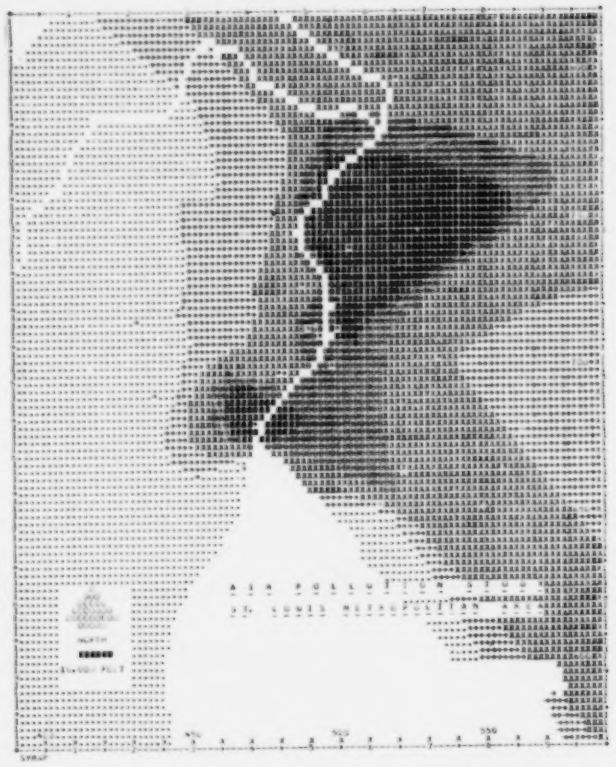


FIGURE A-13

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Suspended Particulates by High-Volume Air Sampler
July 1963-June 1964 (Random Schedule)
a. Arithmetic Mean b. Geometric Mean

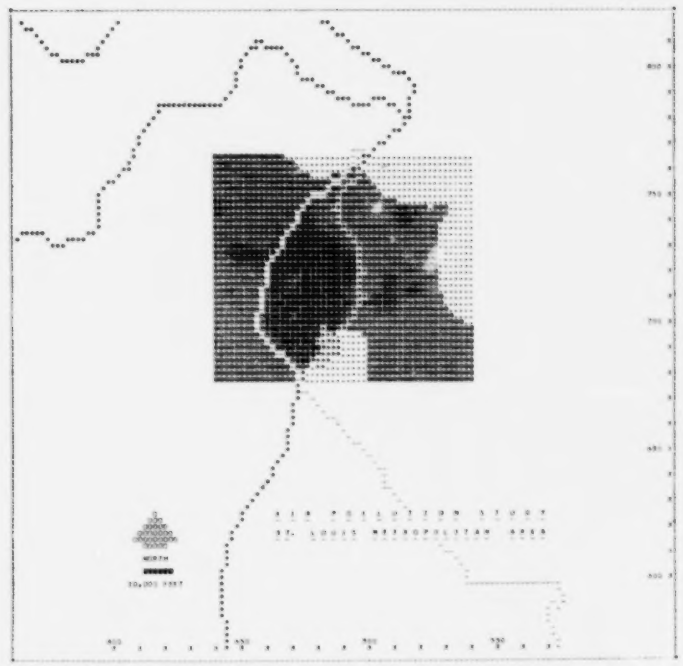


FIGURE A-14

ST. LOUIS REGION STUDY

St. Louis Interstate Air Pollution Study Area

Comparison Map — Winter 1964-65

SO_2 Level versus Population Density

a. Using .03 Level b. Using .04 Level

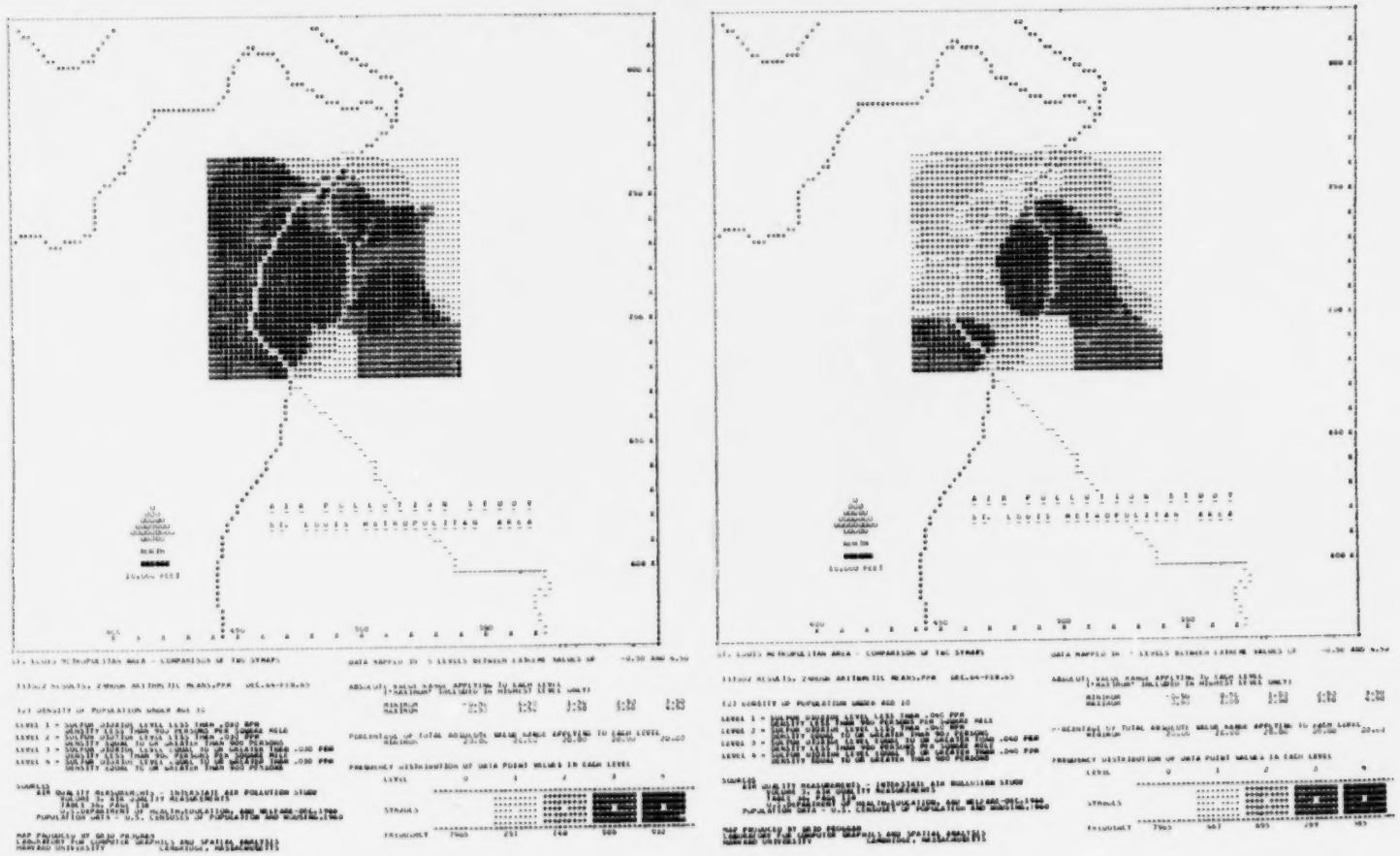


FIGURE A-15

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Comparison Map
SO_2 Level versus Density of Population under Age Ten
a. Using .03 Level b. Using .04 Level

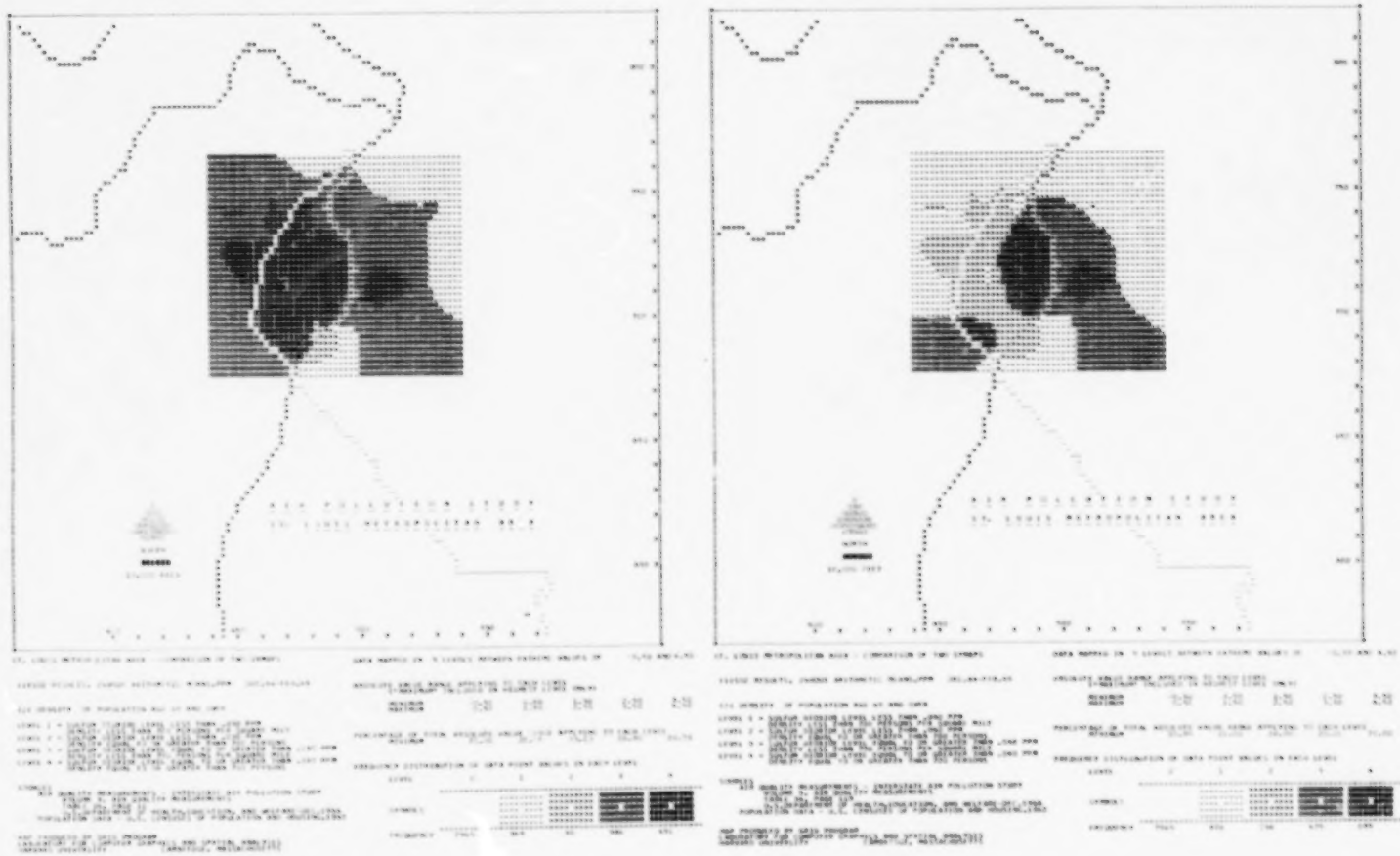


FIGURE A-16

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Comparison Map
SO_2 Level versus Density of Population over Age Sixty-five
a. Using .03 Level b. Using .04 Level

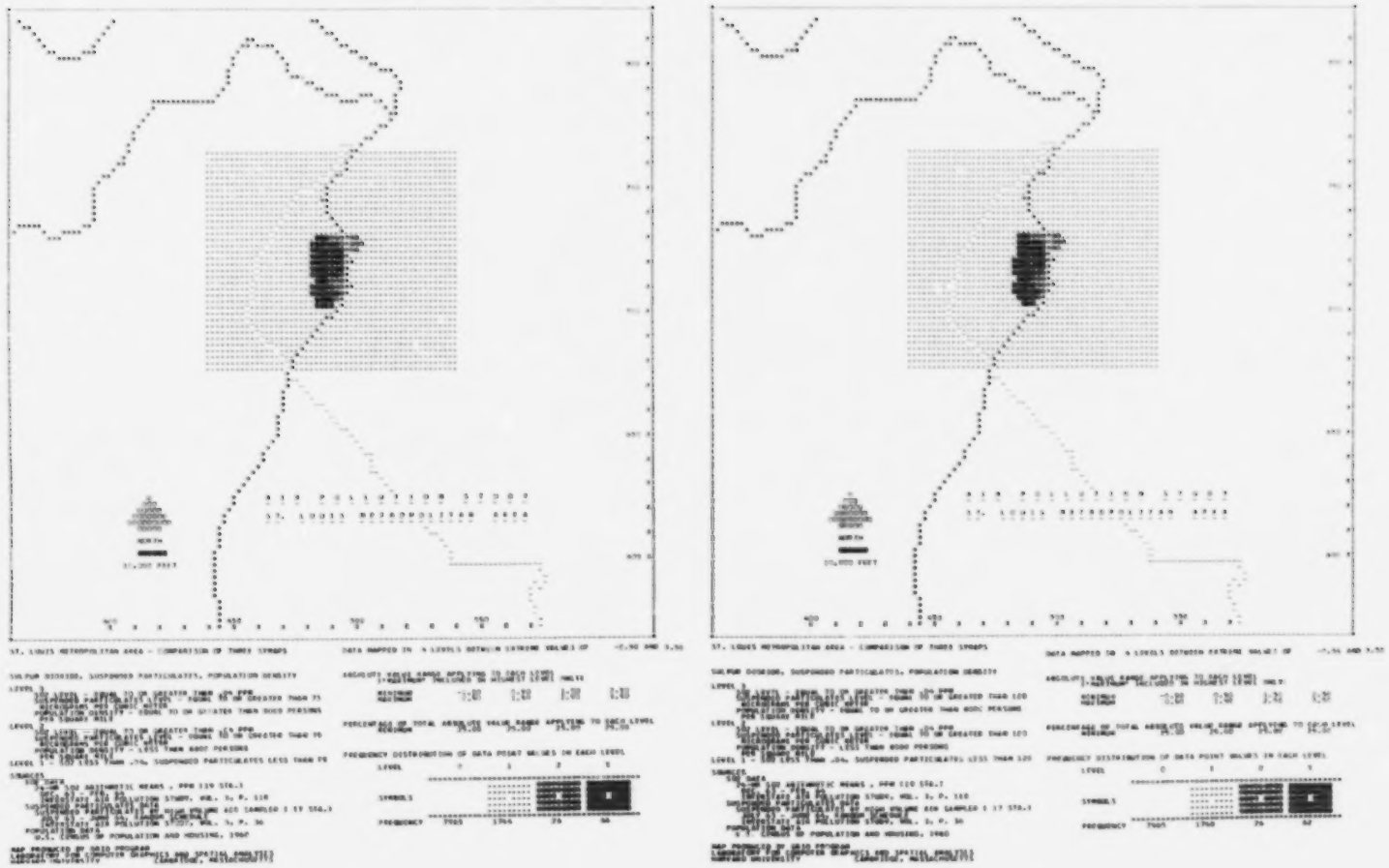


FIGURE A-17

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Comparison Map
a. SO_2 (Winter 1963-64) Using .04 Level, Suspended Particulates (July 1963-June 1964) Using 75 μ/m^3 Level, and Population Density
b. SO_2 (Winter 1963-64) Using .04 Level, Suspended Particulates (July 1963-June 1964) Using 120 μ/m^3 Level, and Population Density

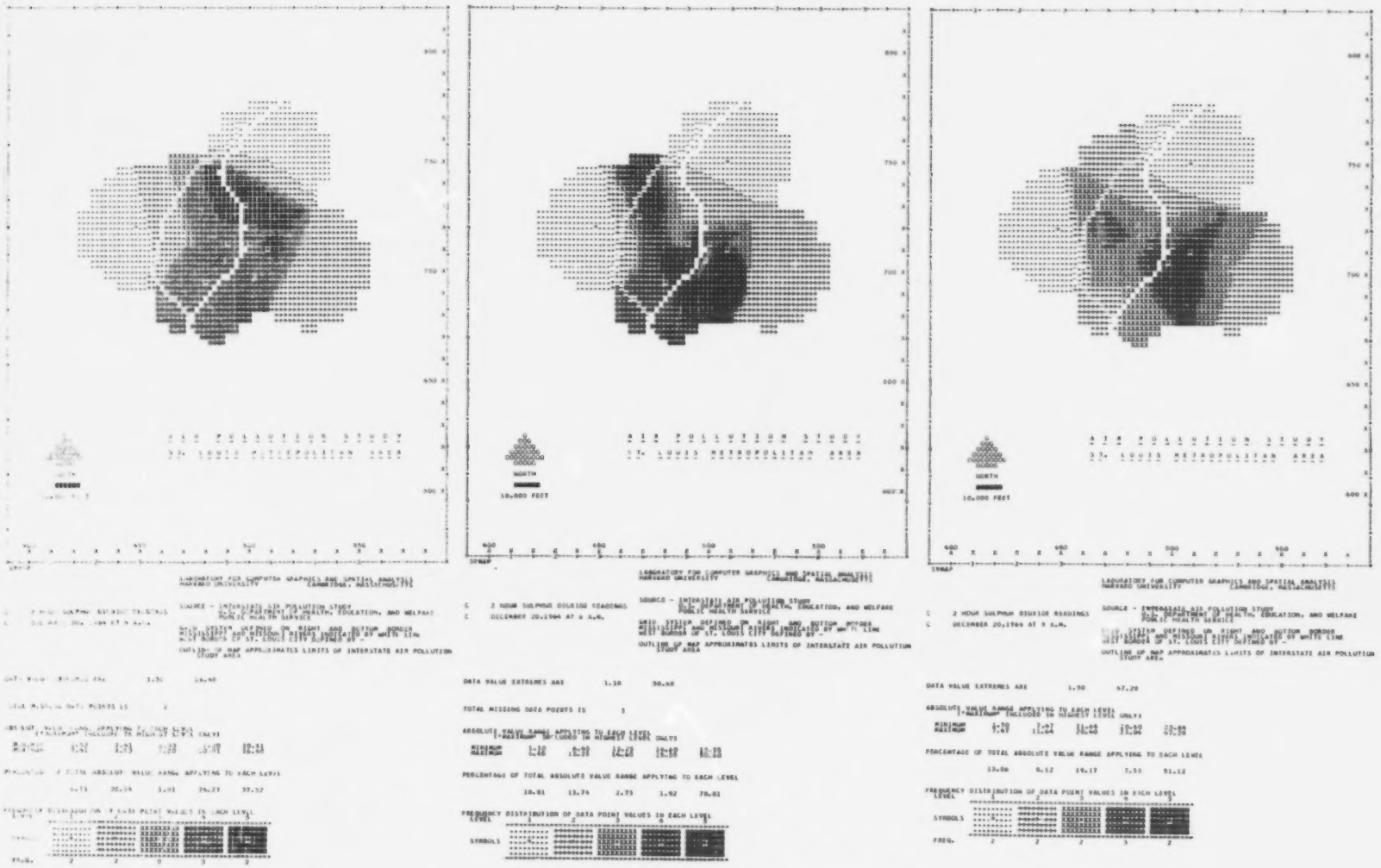


FIGURE B-1

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Surface of 2-hour Sulfur Dioxide Readings
December 20, 1964 — 4, 6, and 8 a.m.

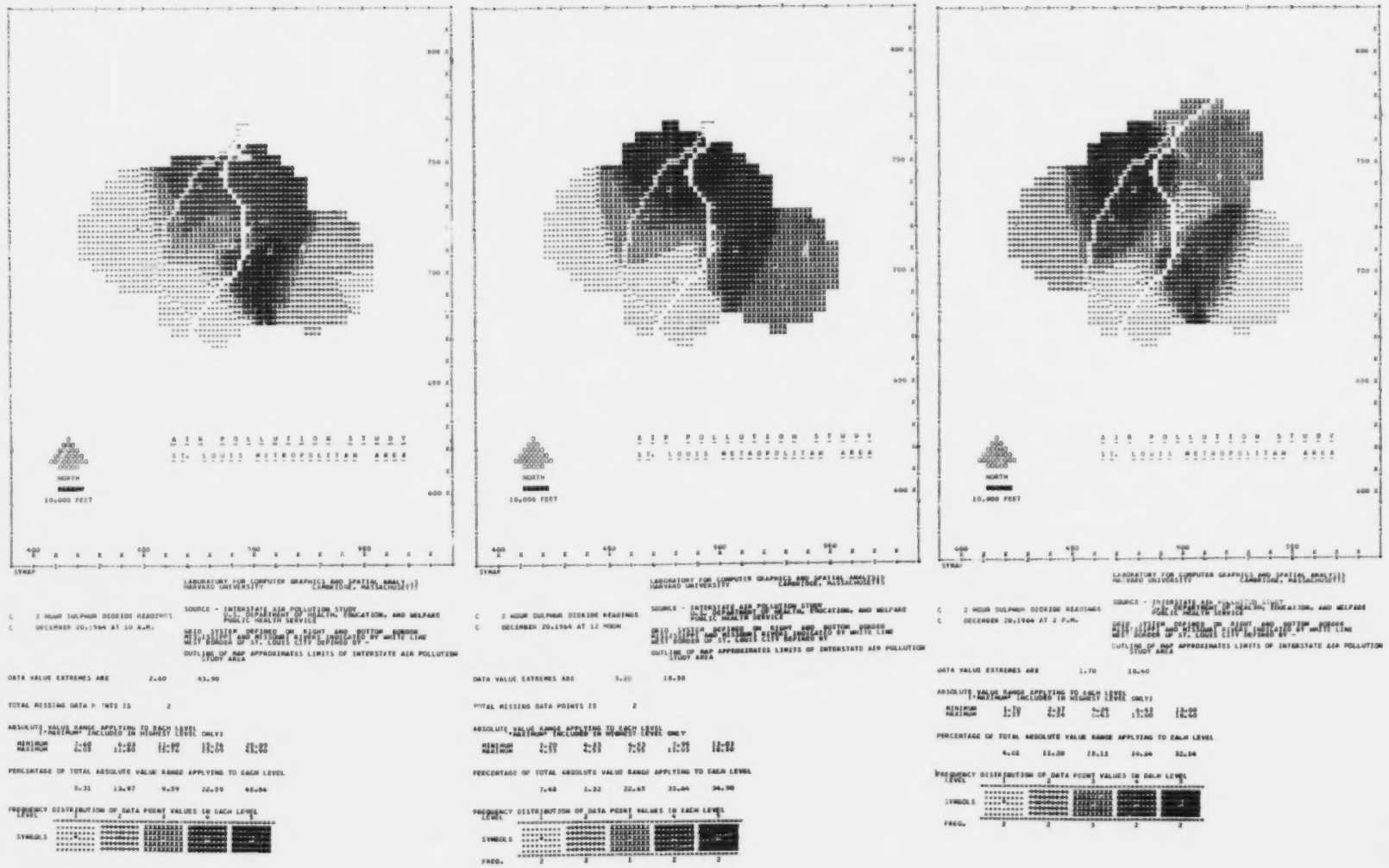


FIGURE B-2

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Surface of 2-hour Sulfur Dioxide Readings
December 20, 1964 — 10, 12 a.m. and 2 p.m.

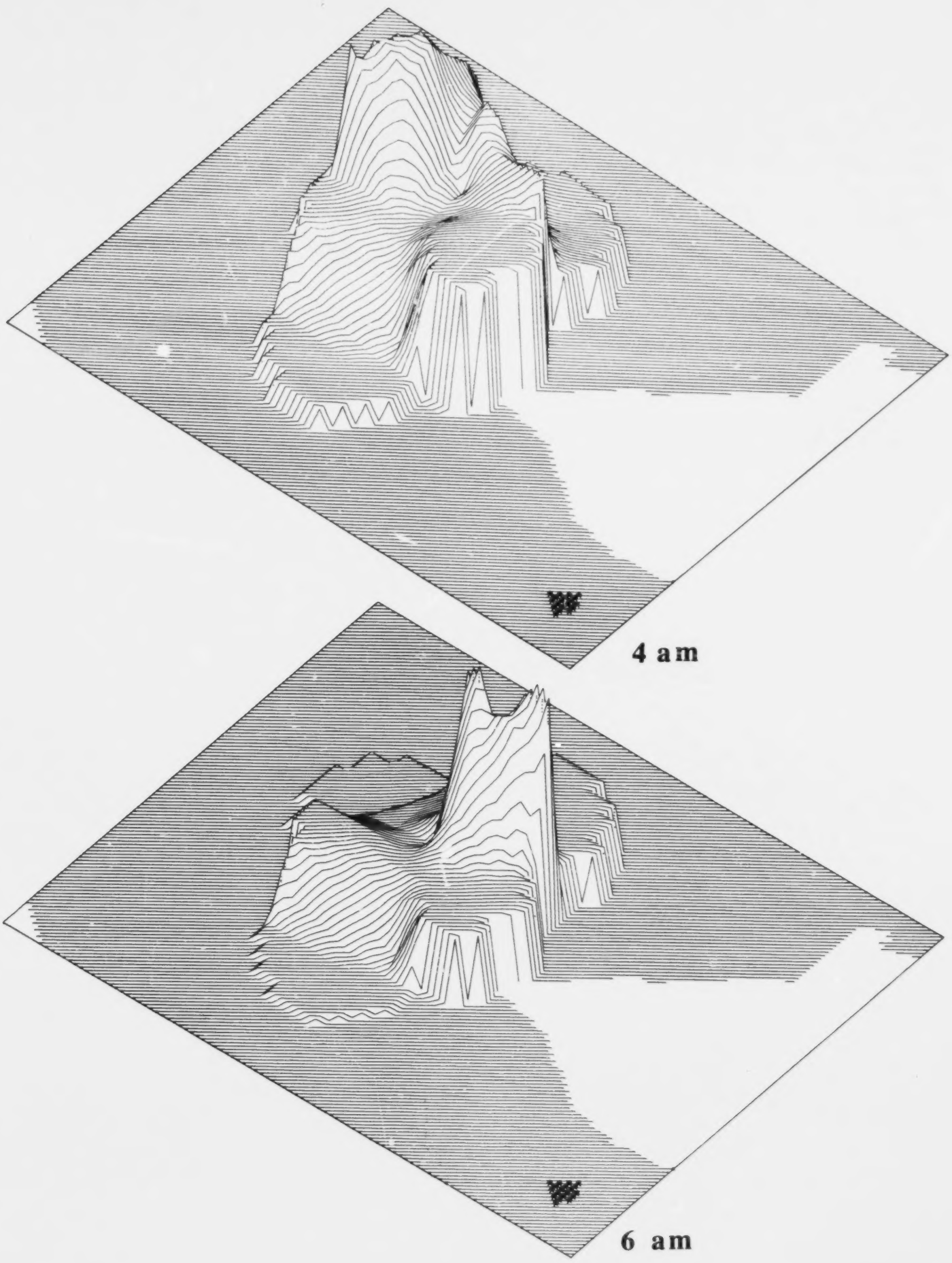


FIGURE B-3

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
2-hour SO_2 Surface in Oblique View
December 20, 1964 — 4 and 6 a.m.

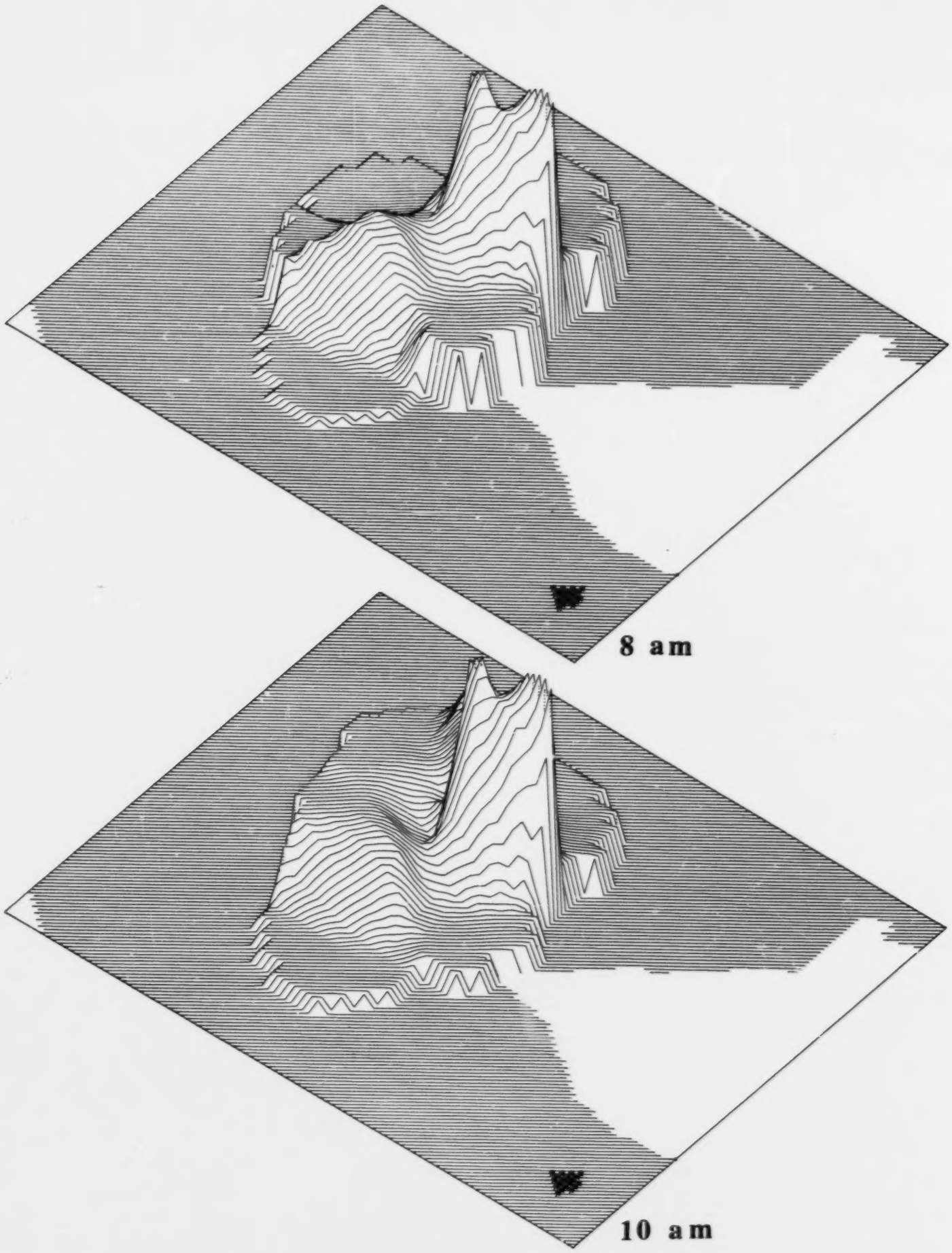


FIGURE B-4

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
2-hour SO_2 Surface in Oblique View
December 20, 1964 — 8 and 10 a.m.

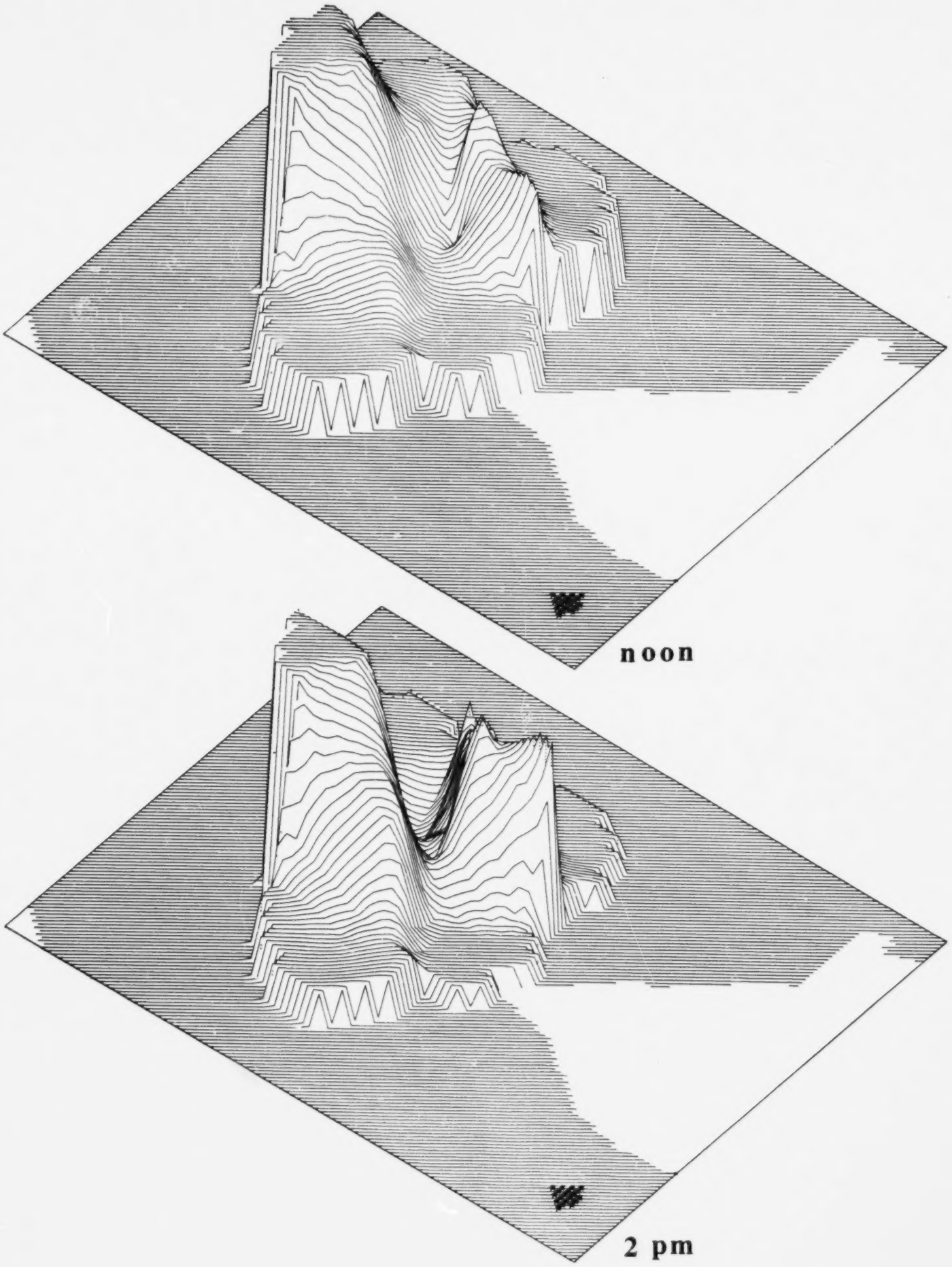


FIGURE B-5

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
2-hour SO_2 Surface in Oblique View
December 20, 1964 — noon and 2 p.m.

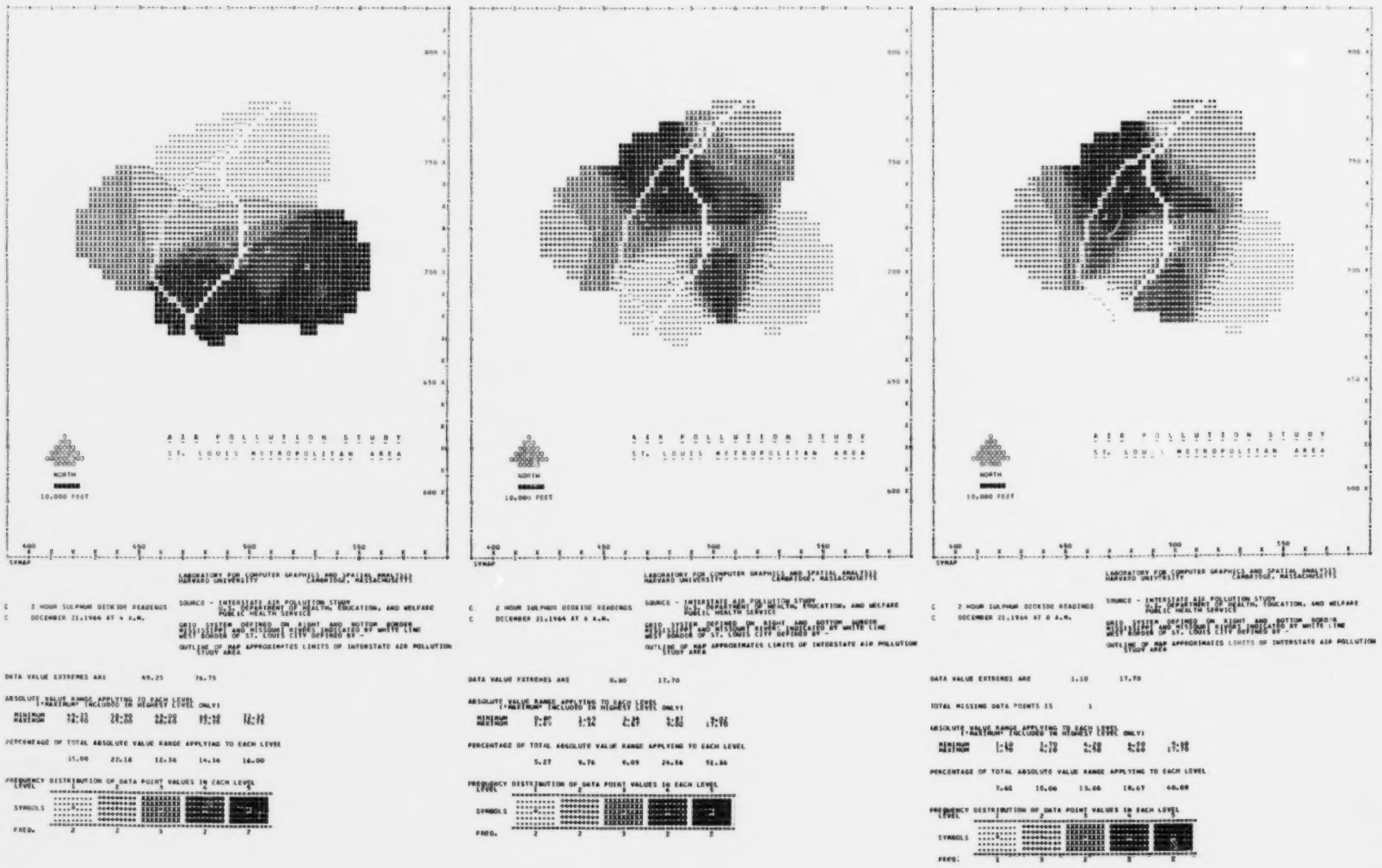


FIGURE B-6

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Surface of 2-hour Sulfur Dioxide Readings
December 21, 1964 — 4, 6, and 8 a.m.

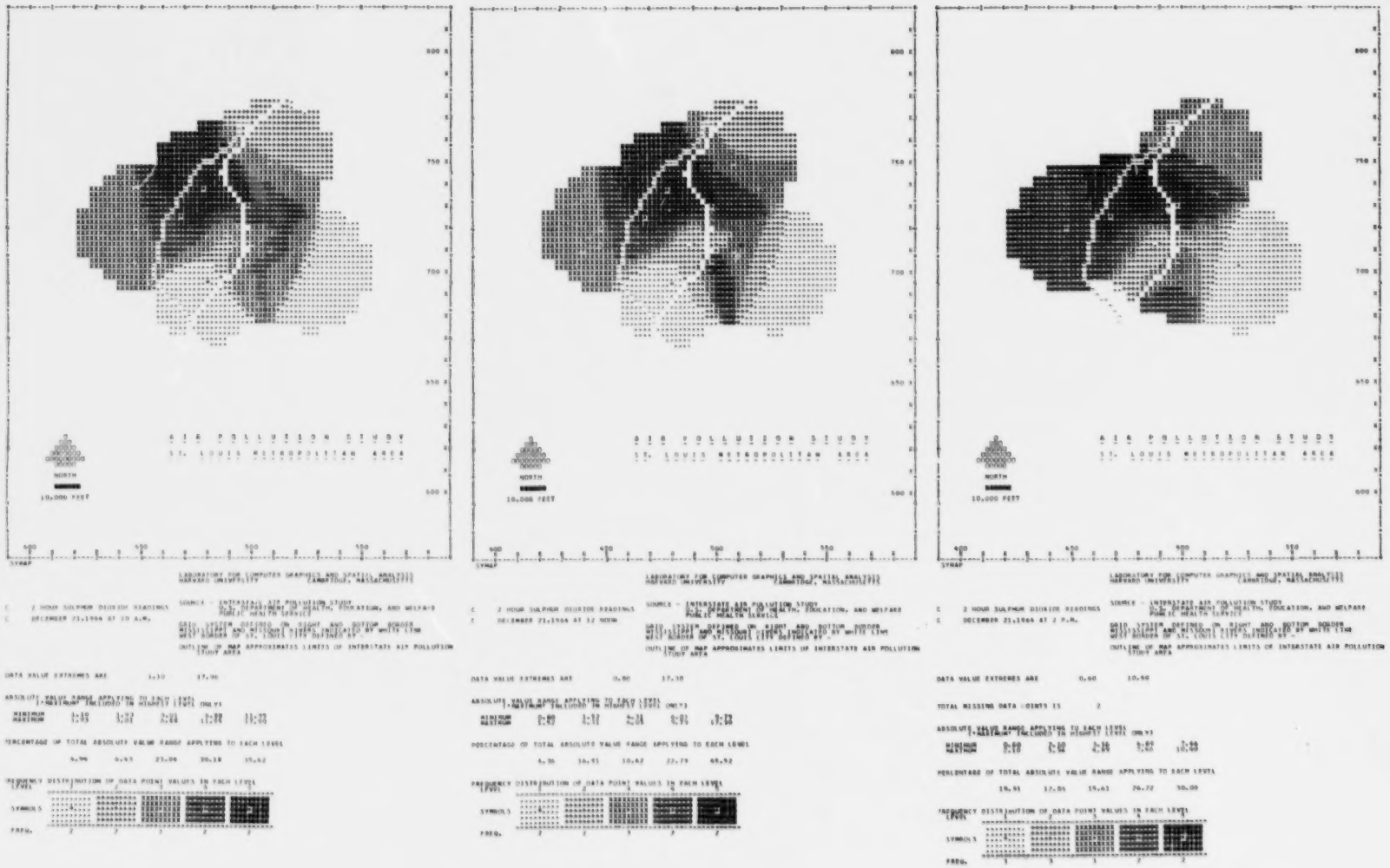
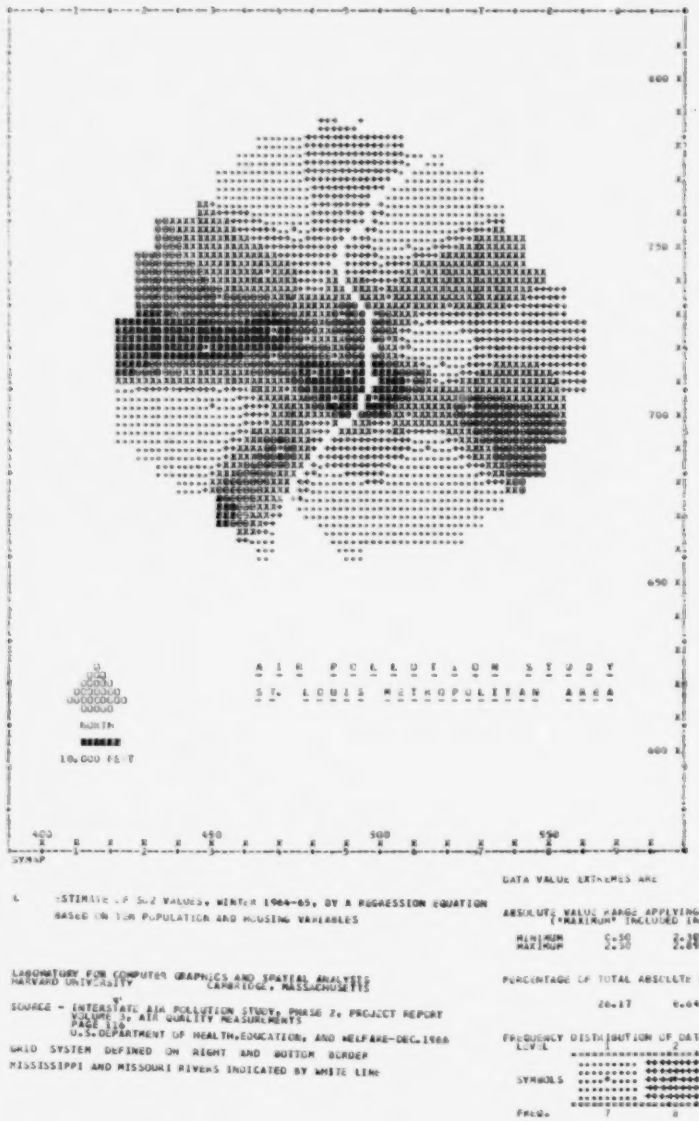


FIGURE B-7

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
Surface of 2-hour Sulfur Dioxide Readings
December 21, 1964 — 10, 12 a.m. and 2 p.m.



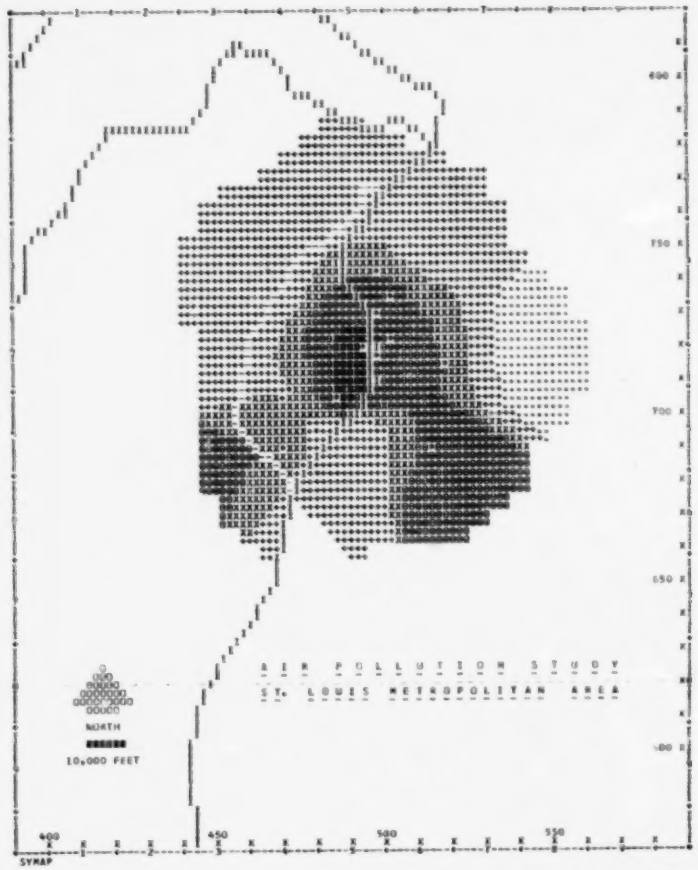
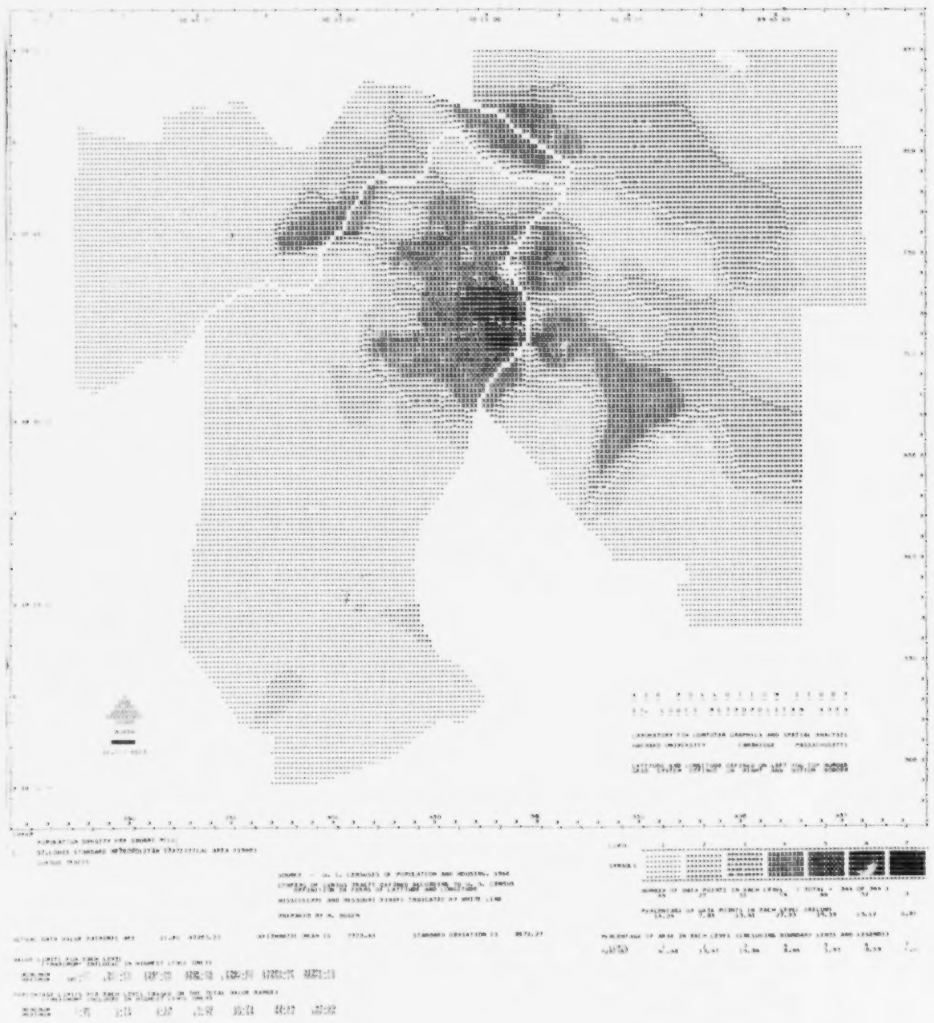


FIGURE B-8

ST. LOUIS REGION STUDY
St. Louis Interstate Air Pollution Study Area
a. Regression Estimate of 24-hour SO_2 Readings
b. 24-hour SO_2 Readings Corresponding to Above



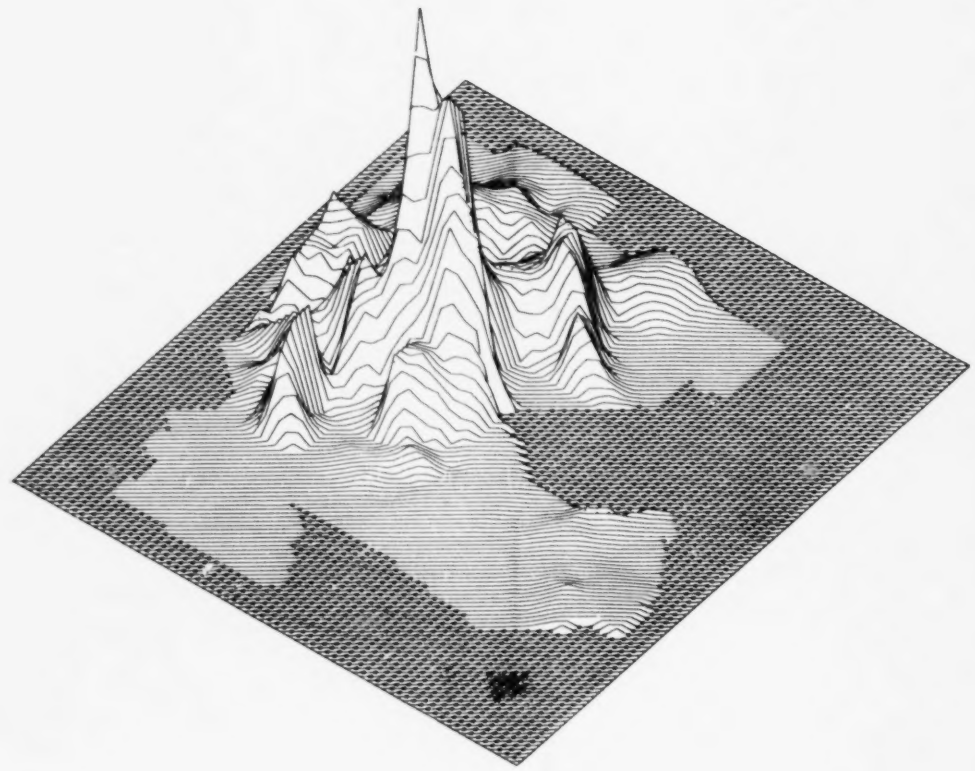


FIGURE B-9

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Population Density
Contour Map and Oblique View

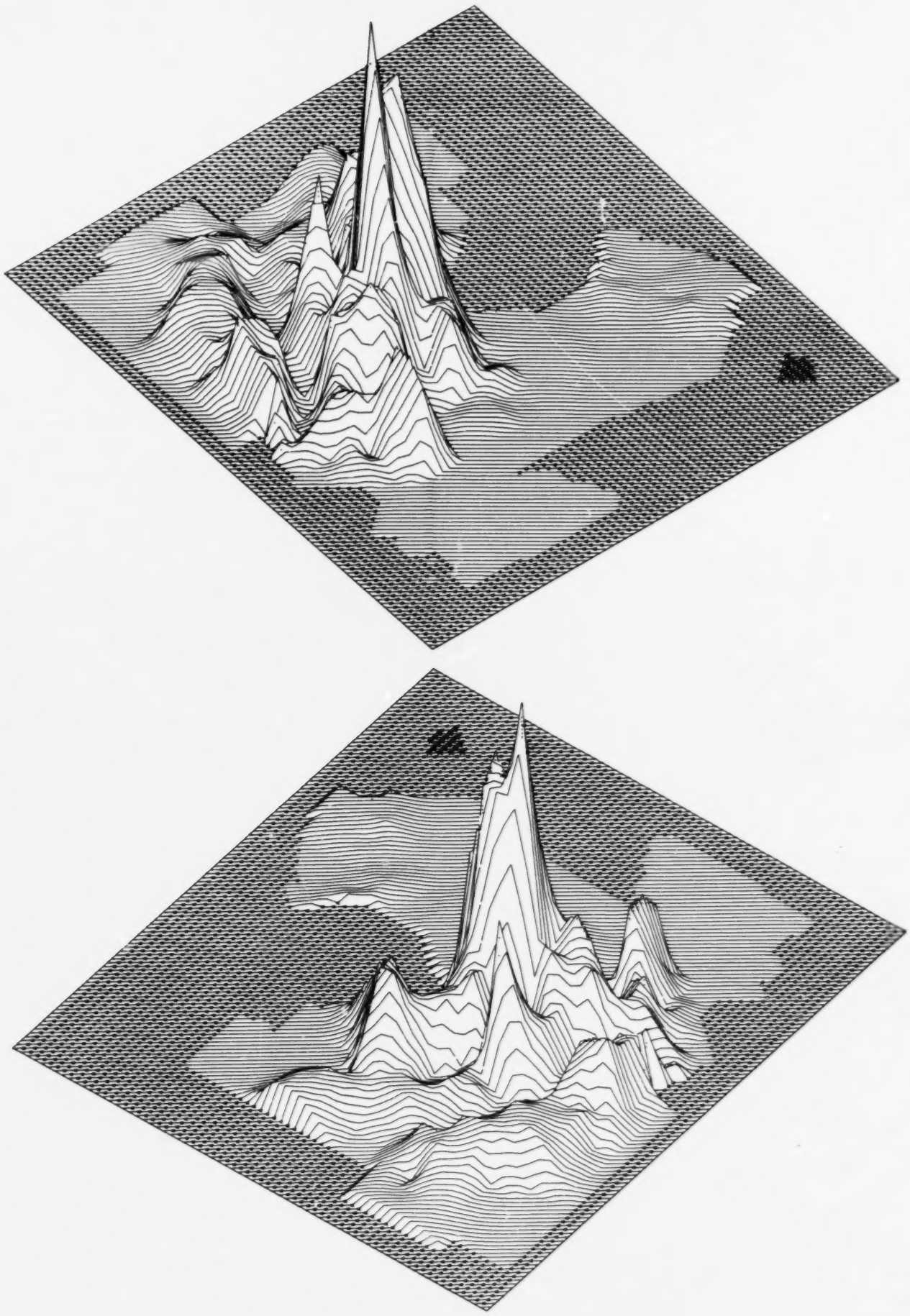


FIGURE B-10

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Population Density — Oblique Views
a. 90° Rotation b. 180° Rotation

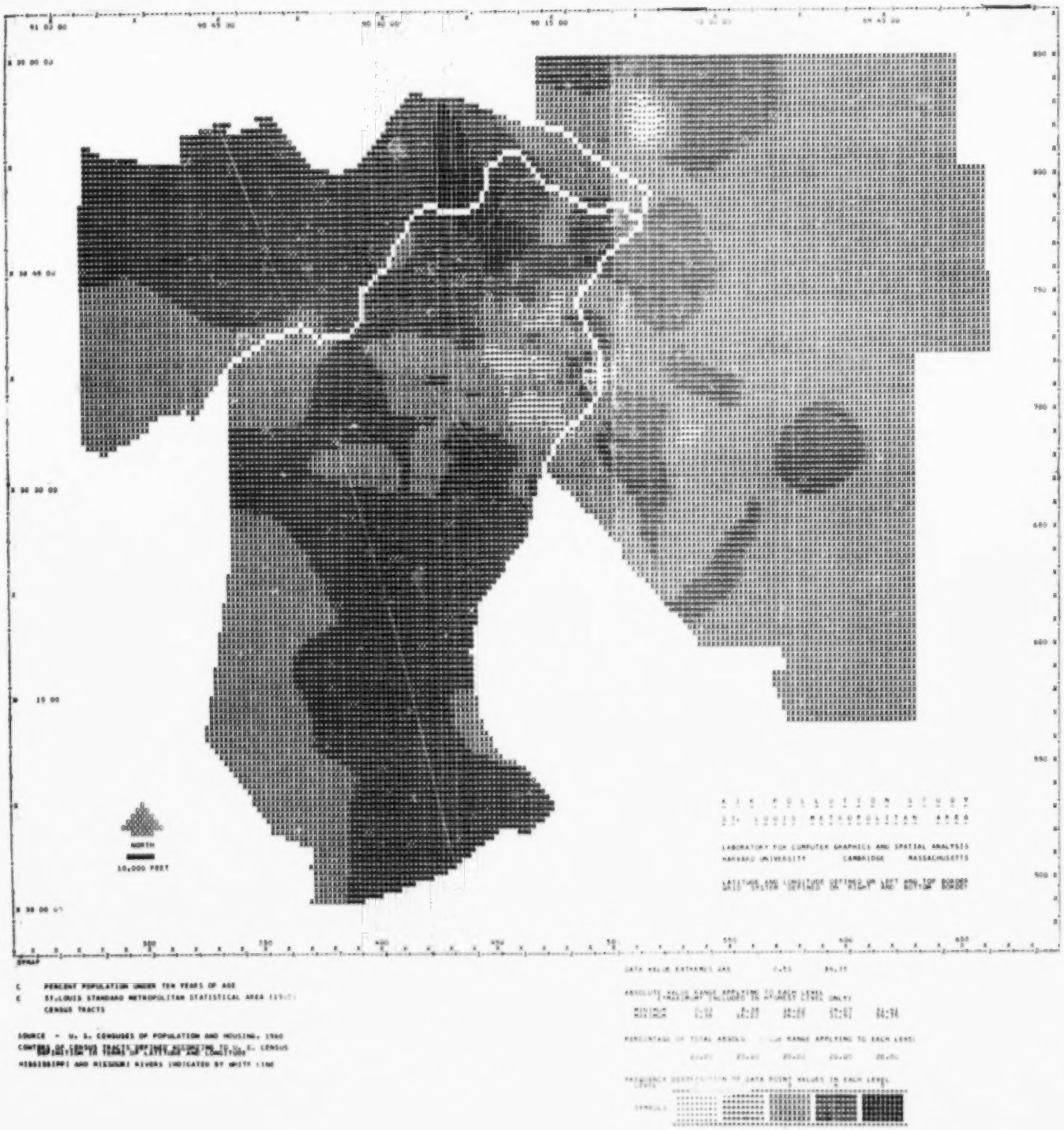


FIGURE B-11

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Population under 10 Years of Age

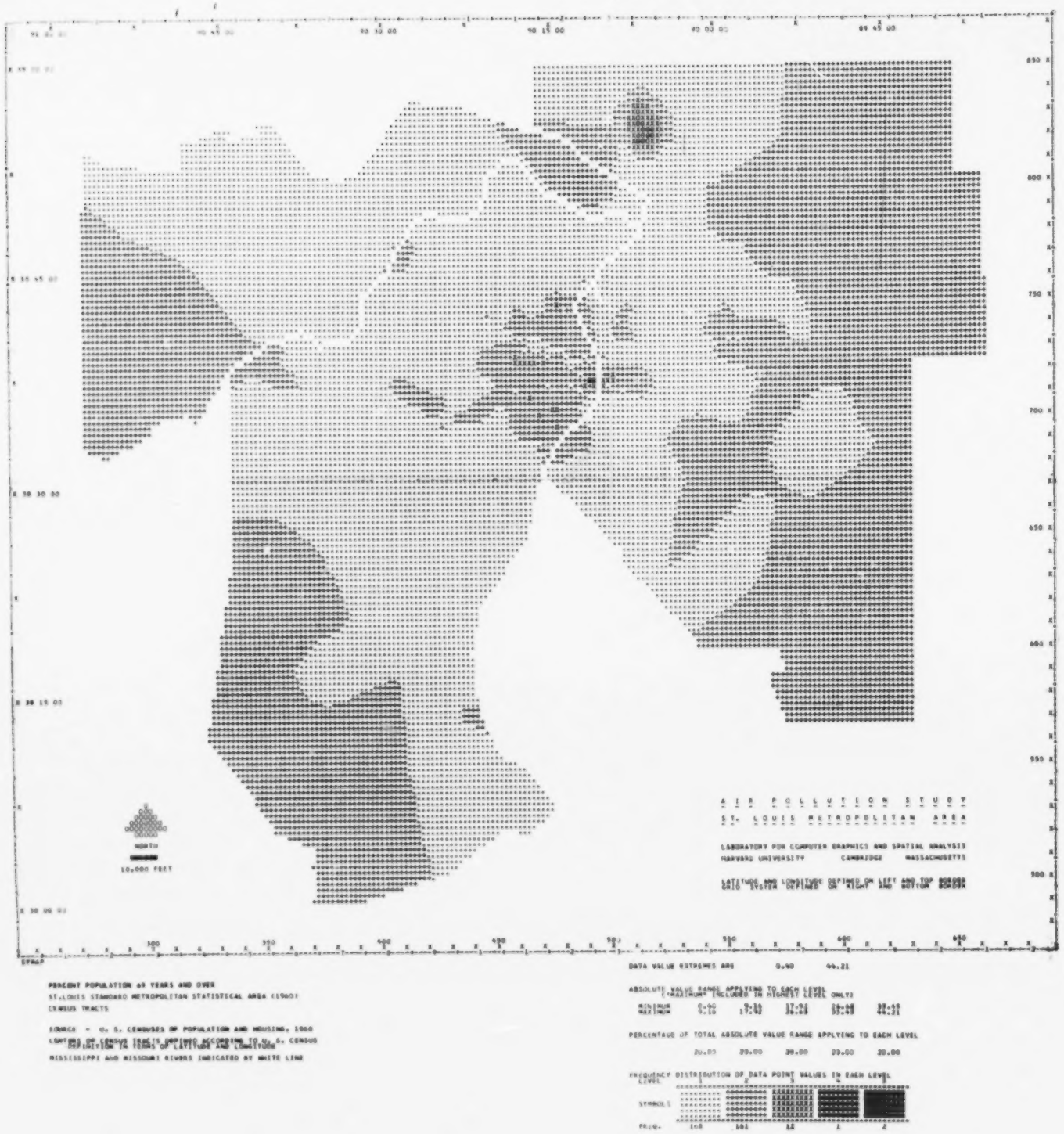


FIGURE B-12

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Population over 65 Years of Age

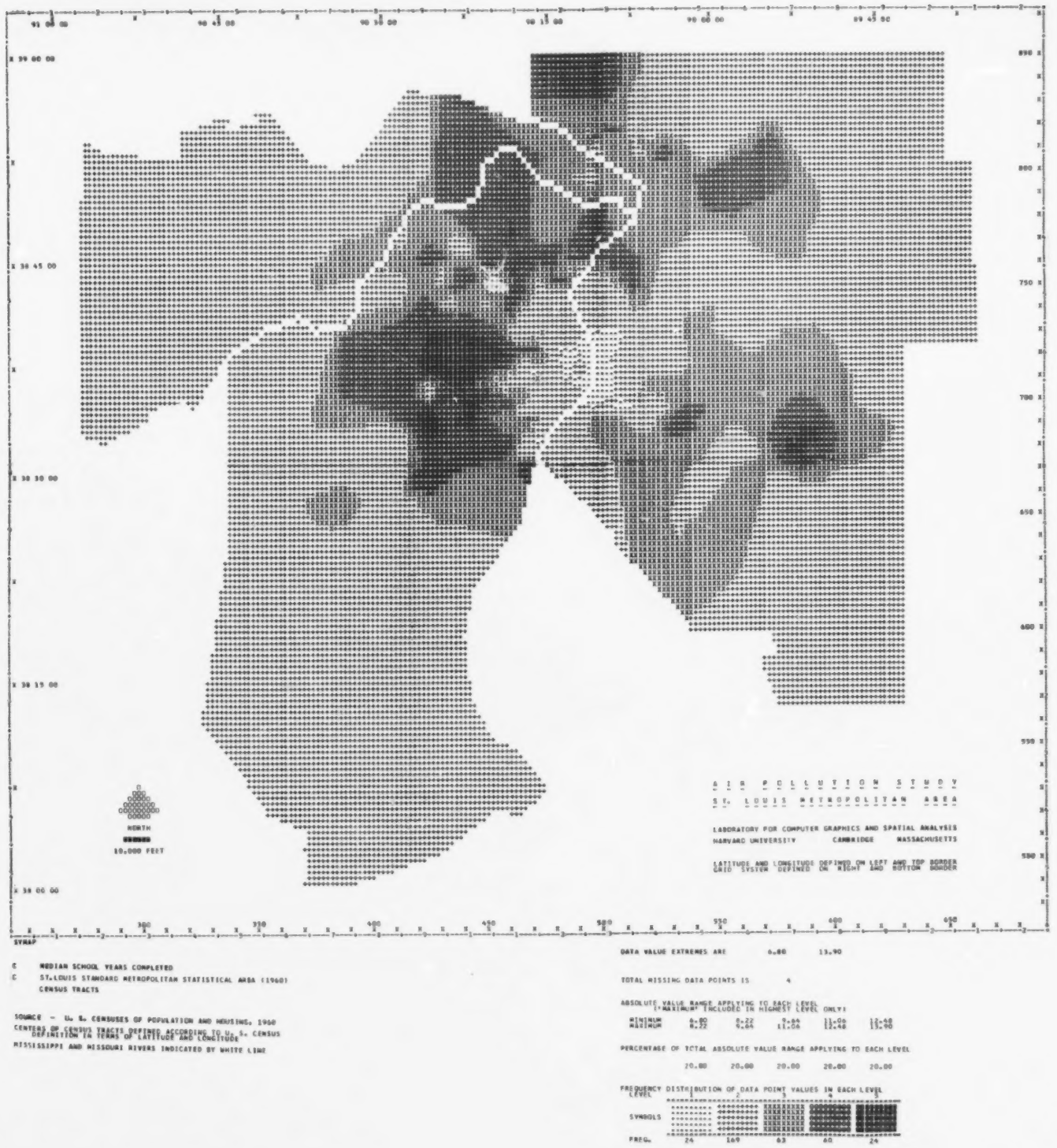


FIGURE B-13

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Median School Years Completed

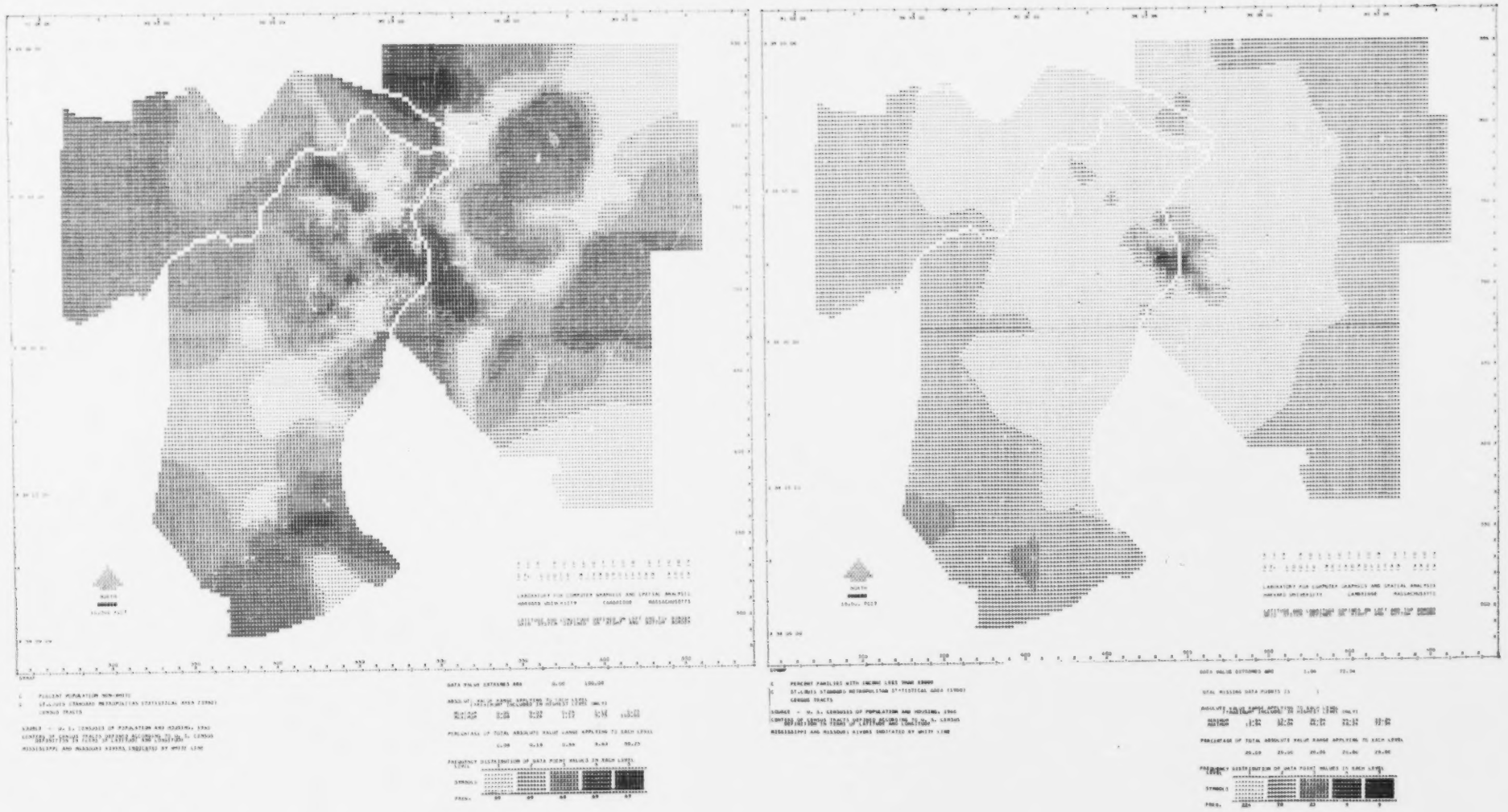


FIGURE B-14

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
a. Percent of Population Non-white
b. Percent of Families with Incomes less than $3000/yr.

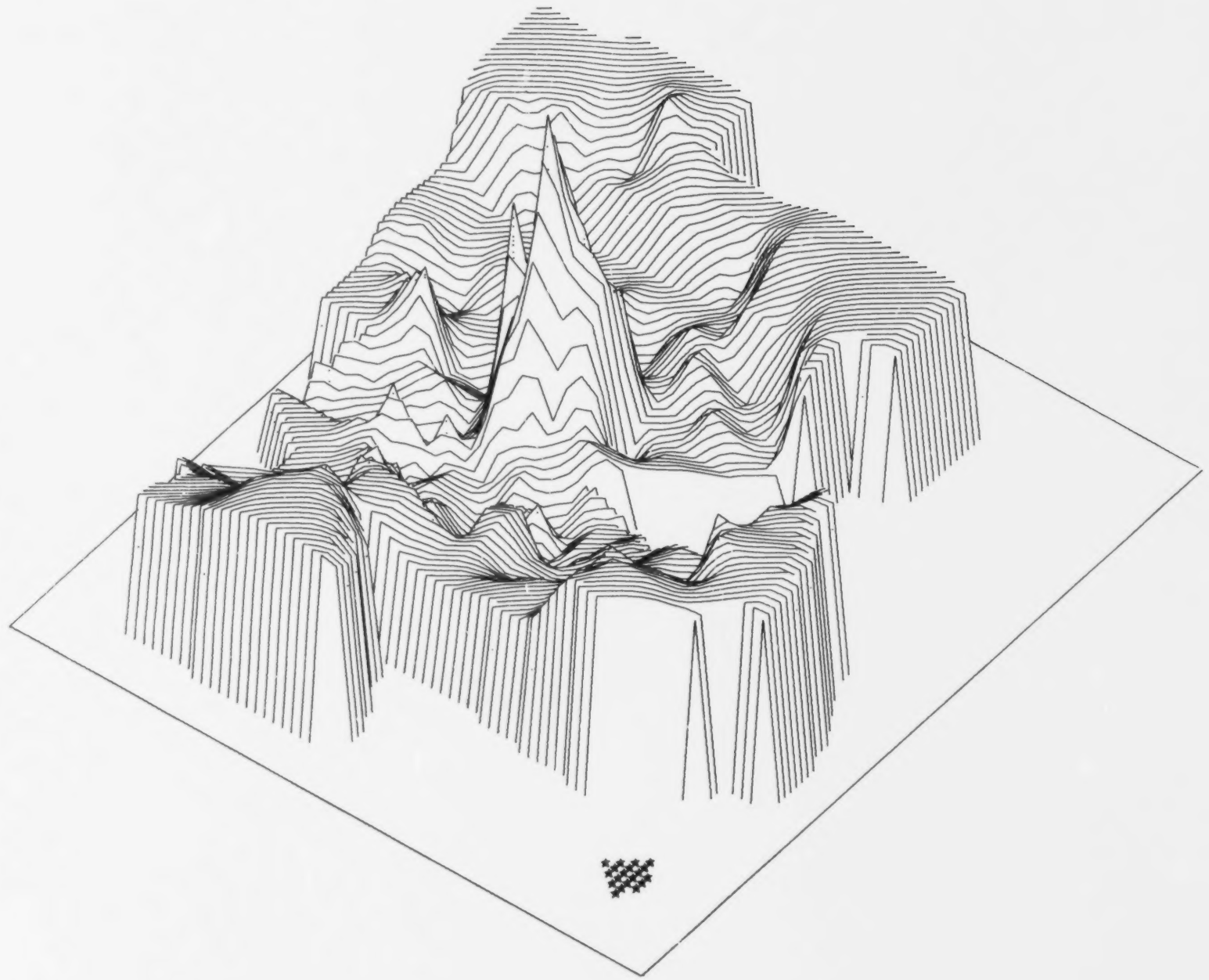
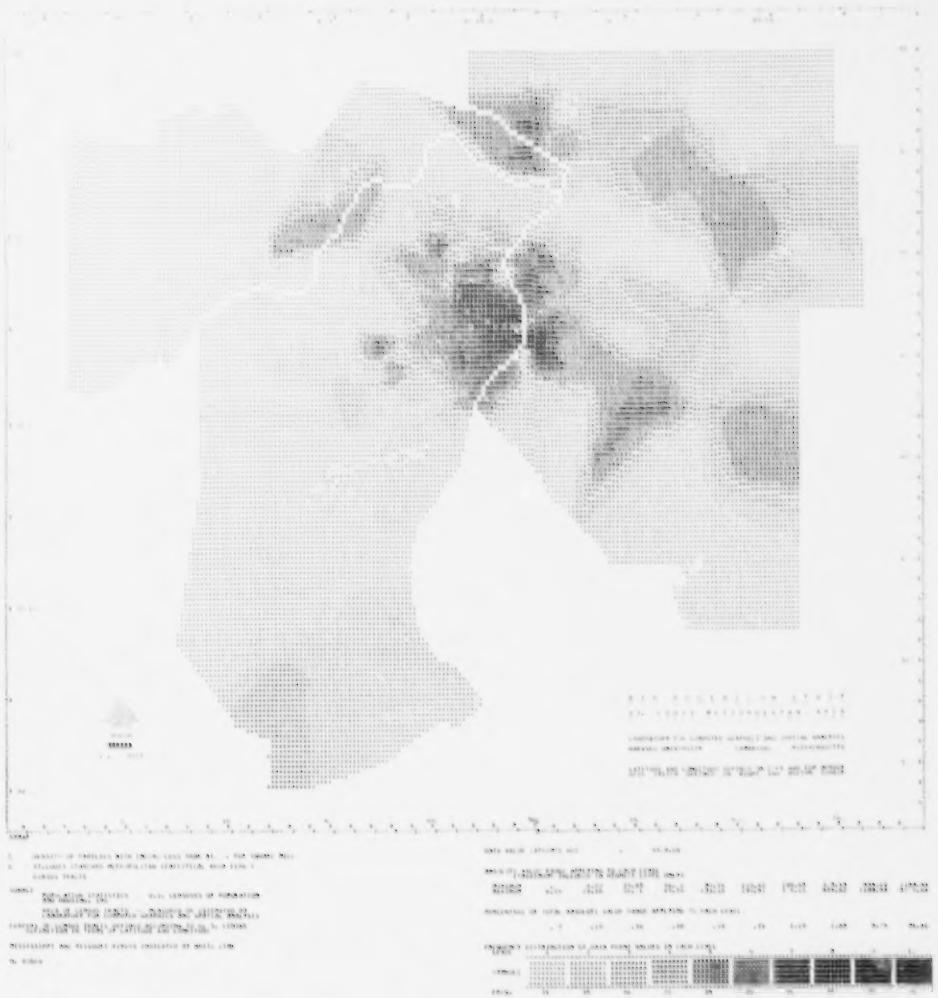


FIGURE B-15

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Families with Incomes less than $3000/yr.
Oblique View



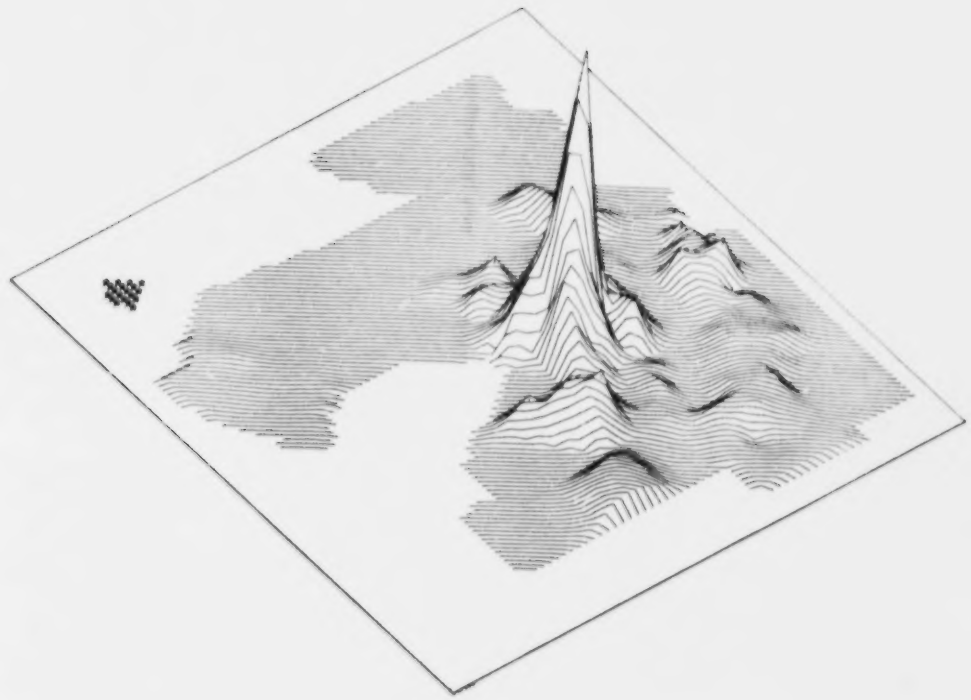
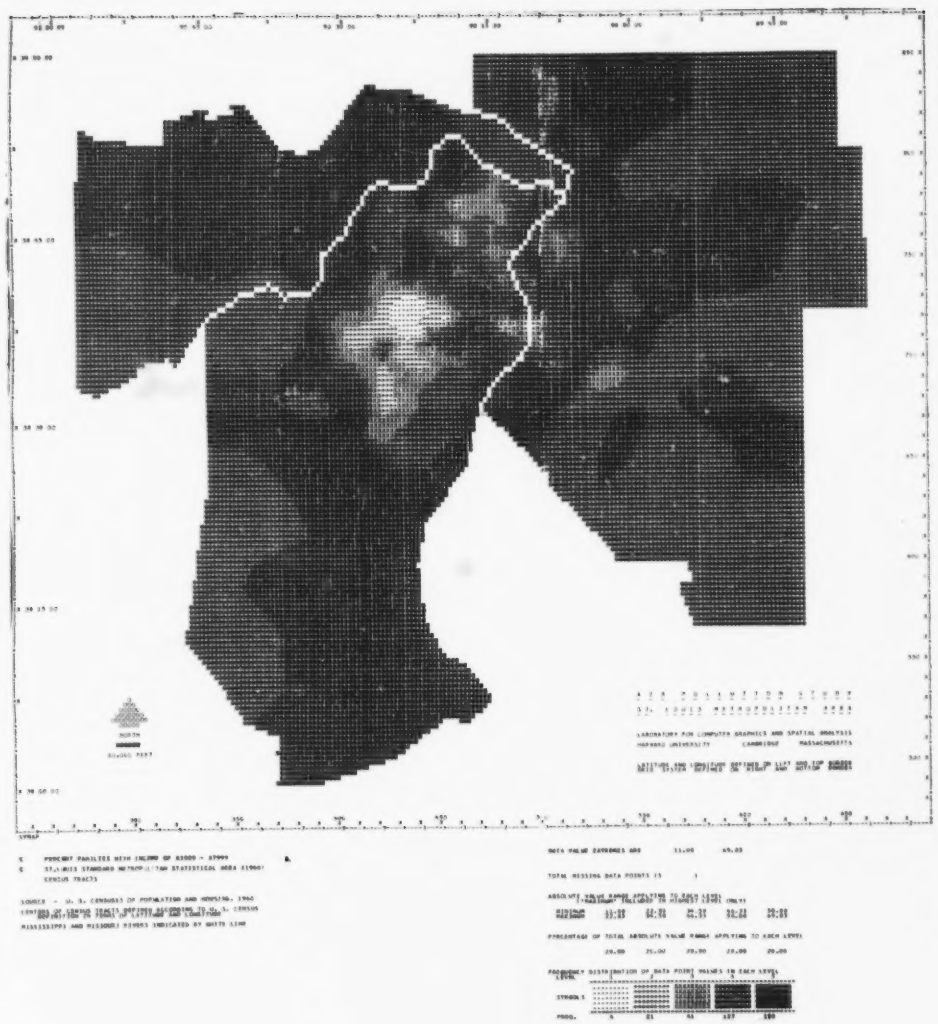


FIGURE B-16

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Density of Families with Incomes less than $3000/yr.



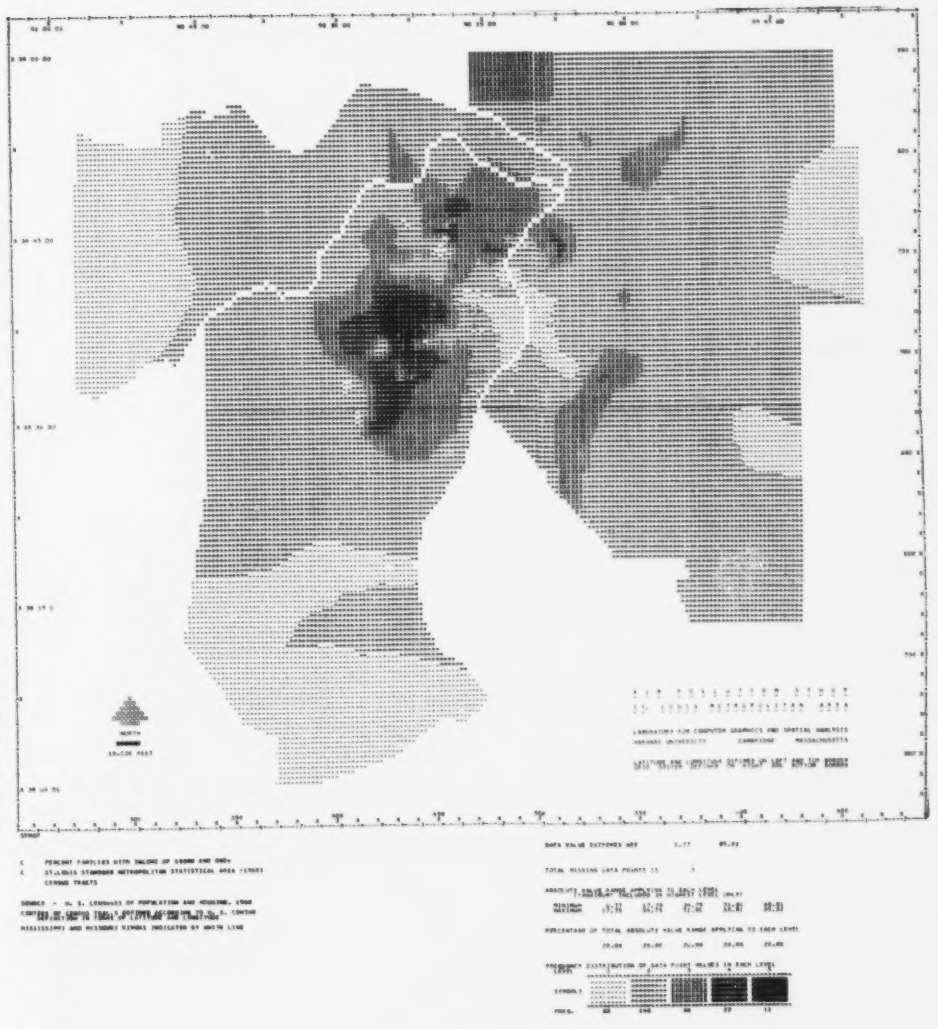


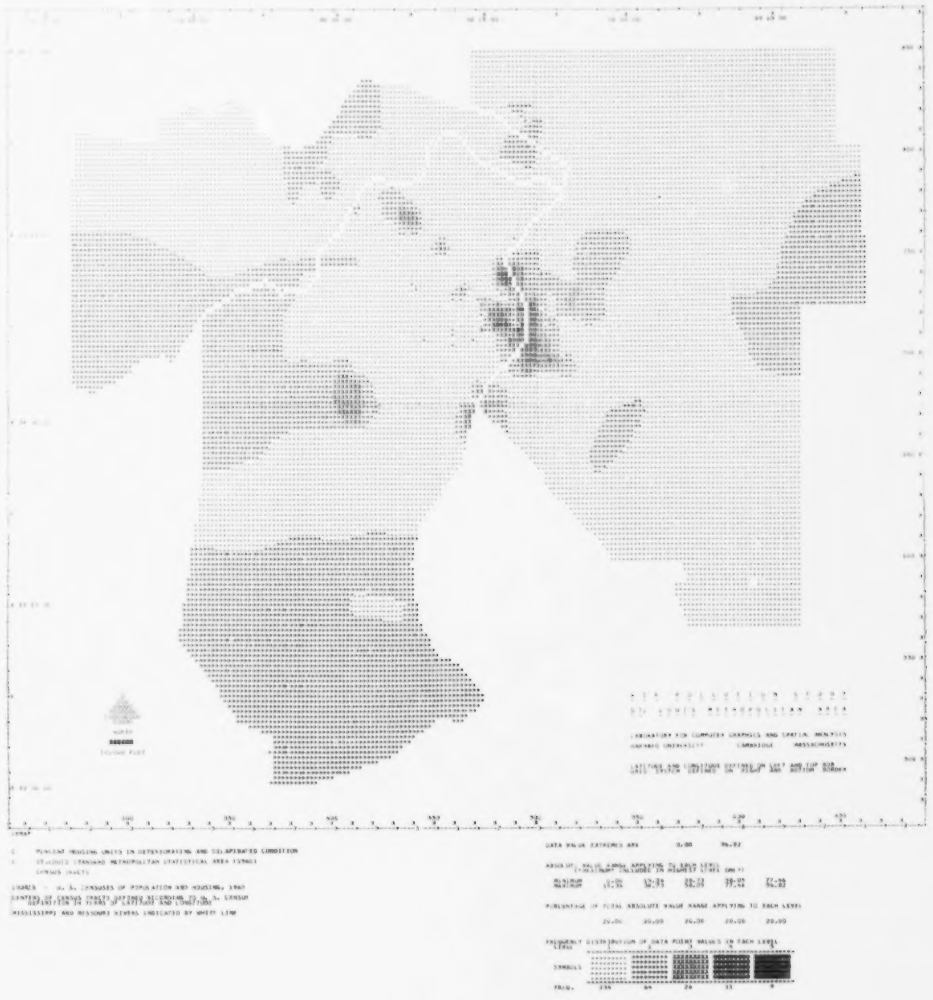
FIGURE B-17

ST. LOUIS REGION STUDY

Standard Metropolitan Statistical Area — 1960 Census

a. Percent of Families with Incomes from $3000 to $7999/yr.

b. Percent of Families with Incomes of $8000/yr. or More



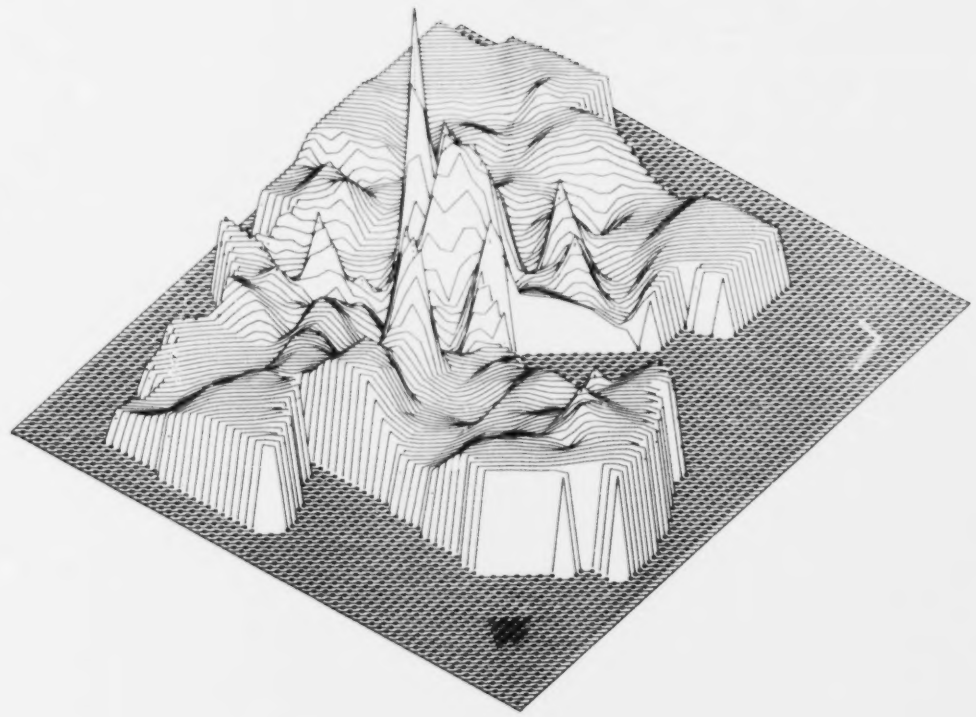


FIGURE B-18

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Housing Units Deteriorating and/or Dilapidated
a. Contour View b. Oblique View

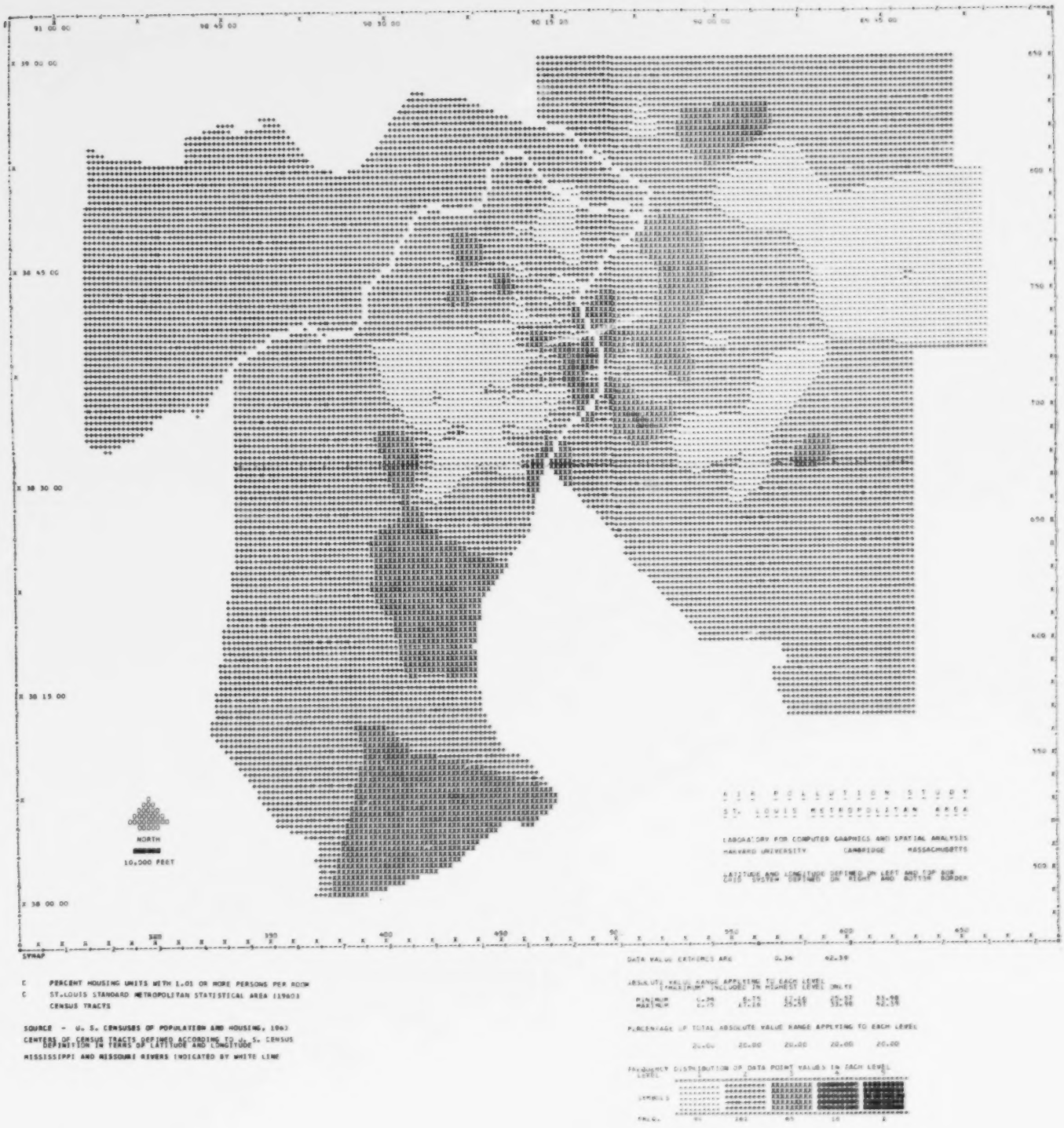


FIGURE B-19

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Housing Units with 1.01 or more Persons per Room

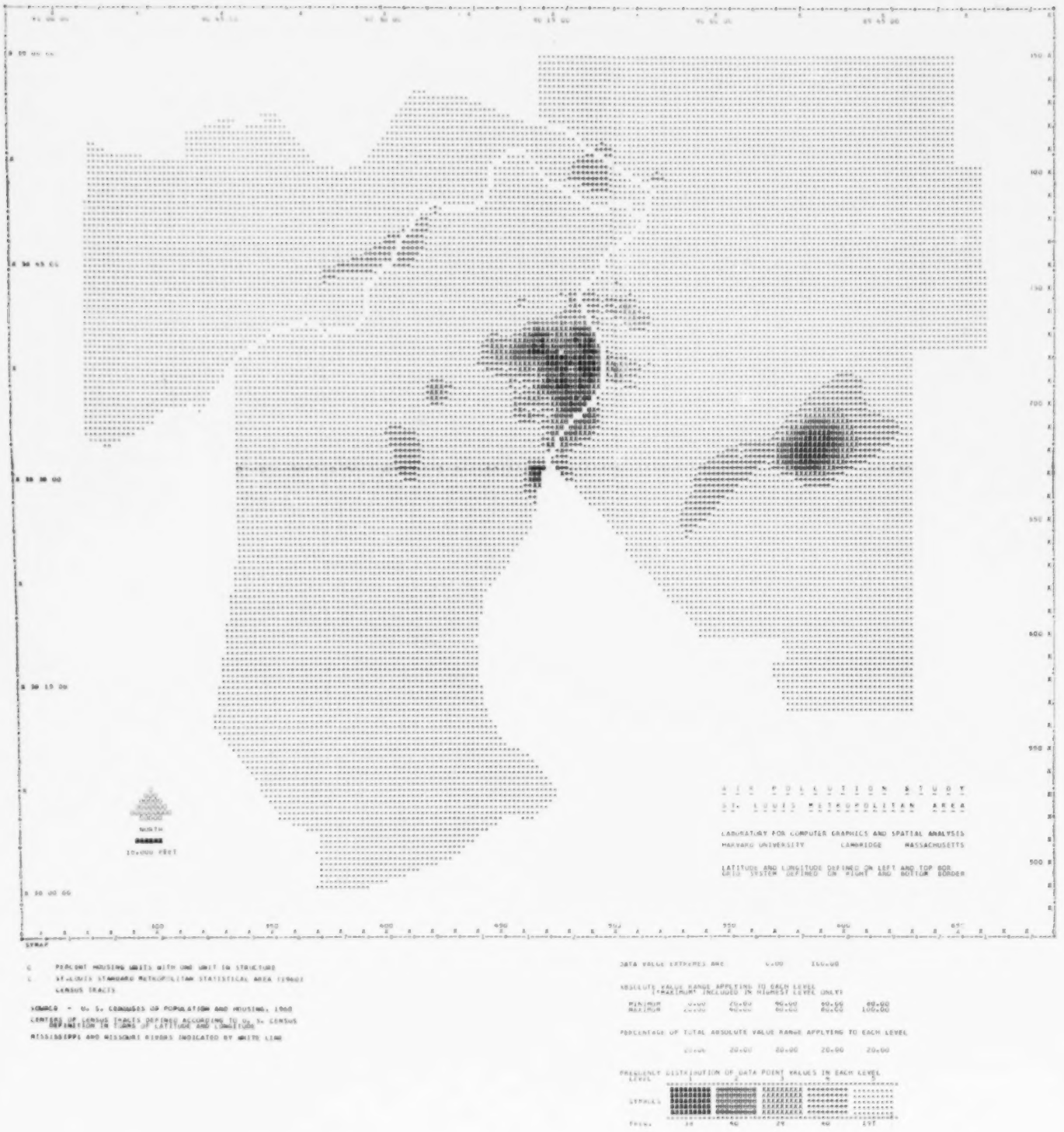


FIGURE B-20

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Housing with 1 Unit/Structure

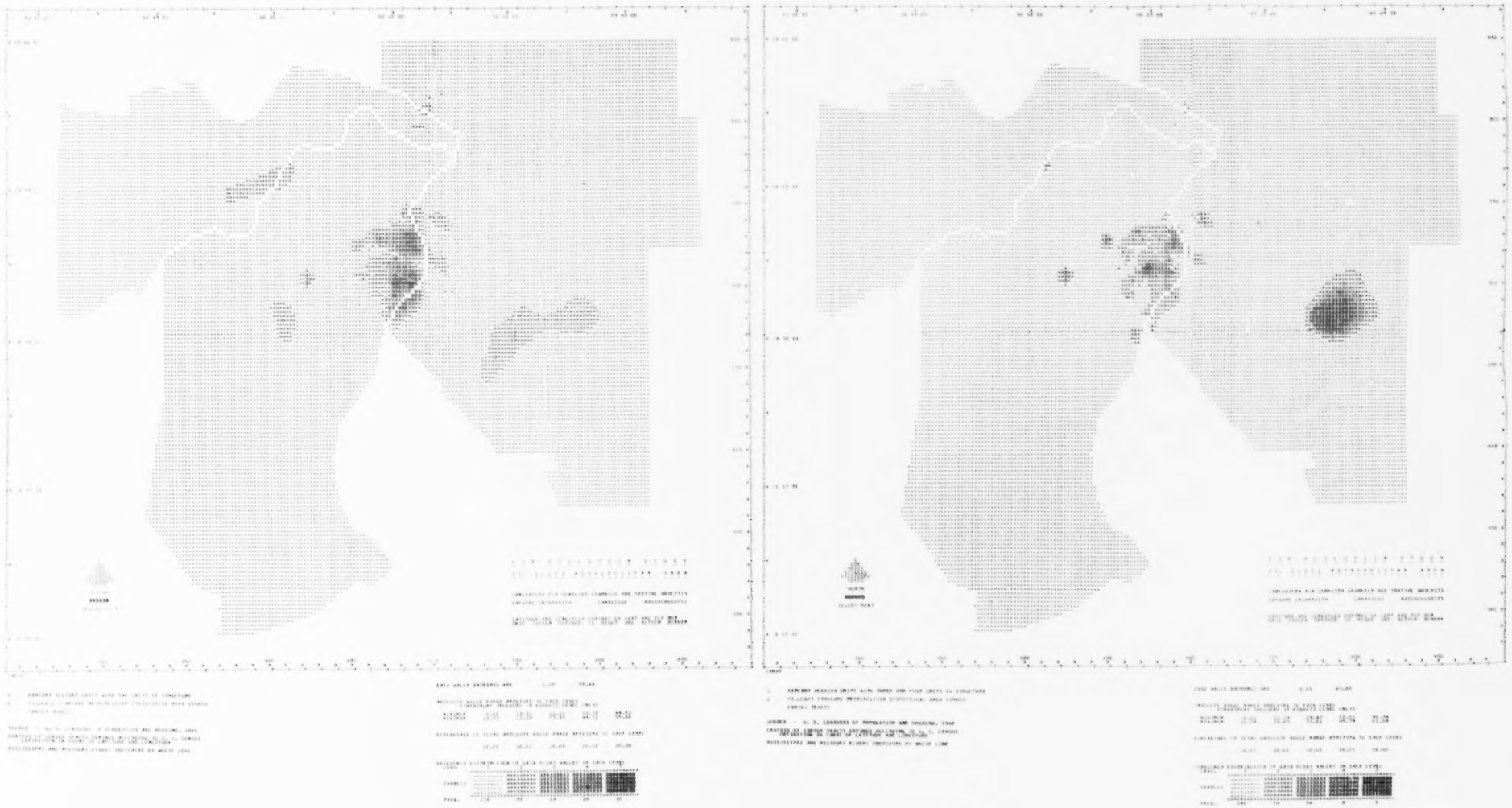


FIGURE B-21

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
a. Percent of Housing with 2 Units/Structure
b. Percent of Housing with 3 or 4 Units/Structure

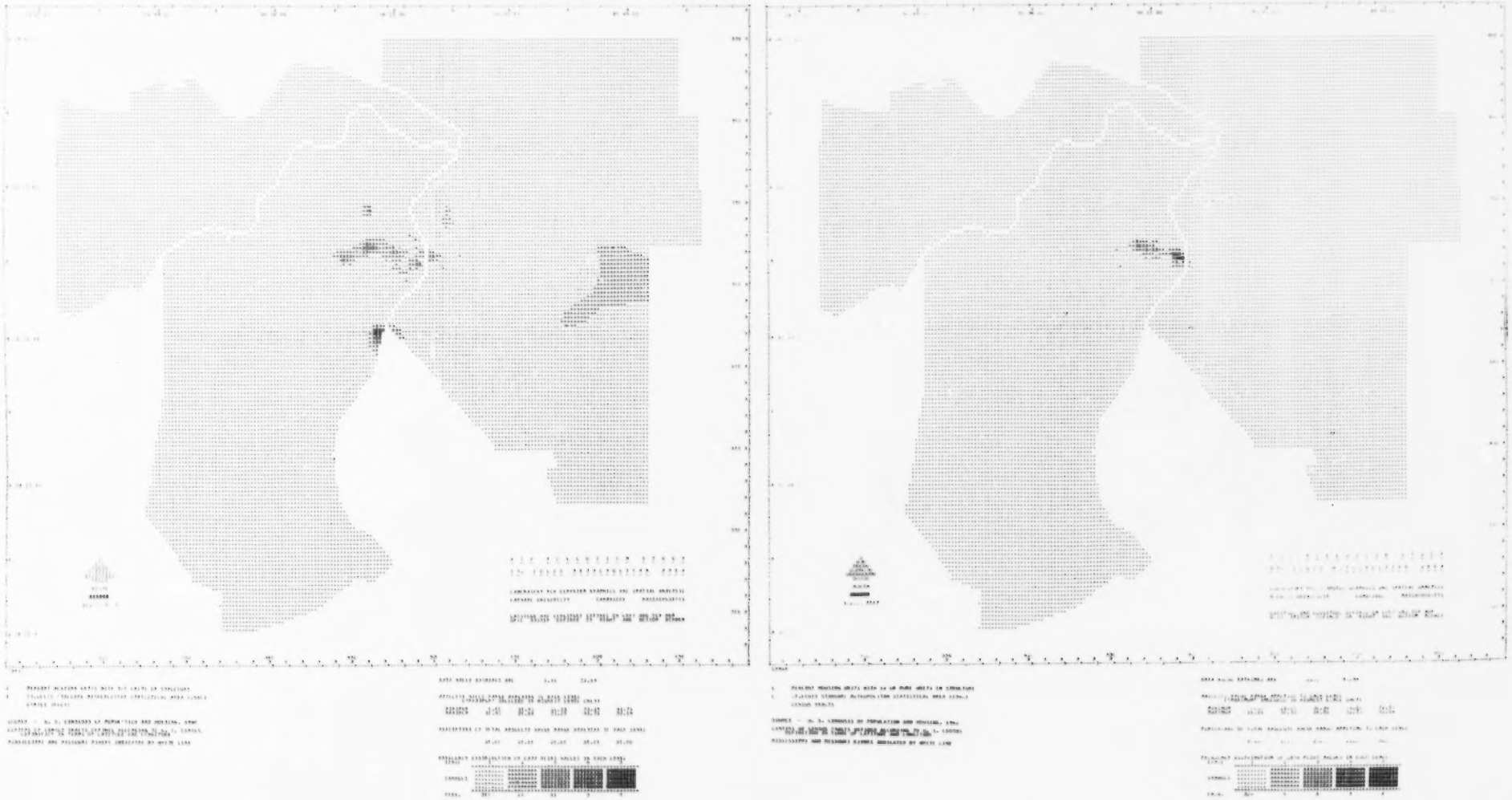


FIGURE B-22

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
a. Percent of Housing with 5 to 9 Units/Structure
b. Percent of Housing with 10 or more Units/Structure

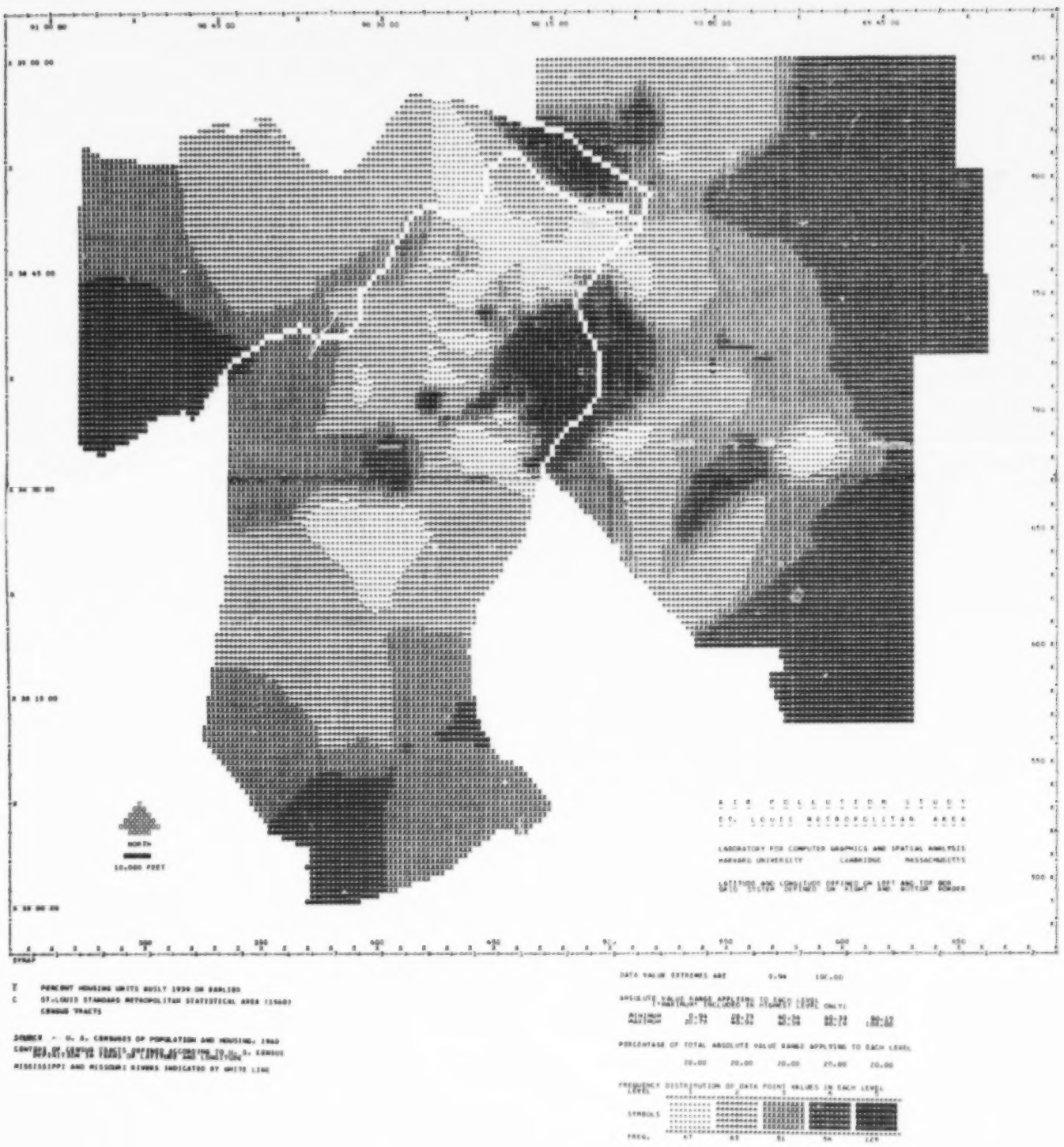


FIGURE B-23

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Housing Built in 1939 or Earlier

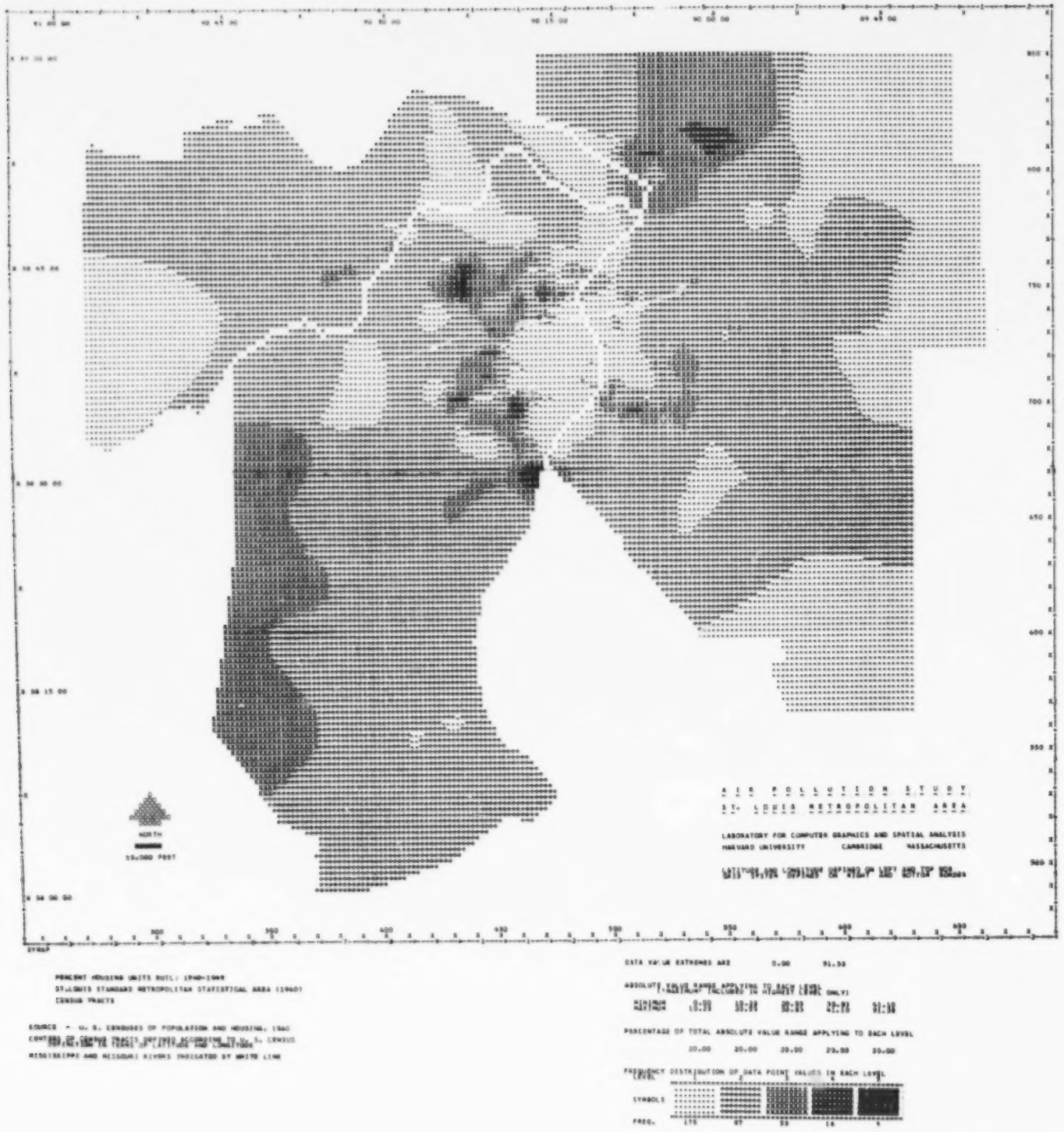


FIGURE B-24

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Housing Built 1940-1949

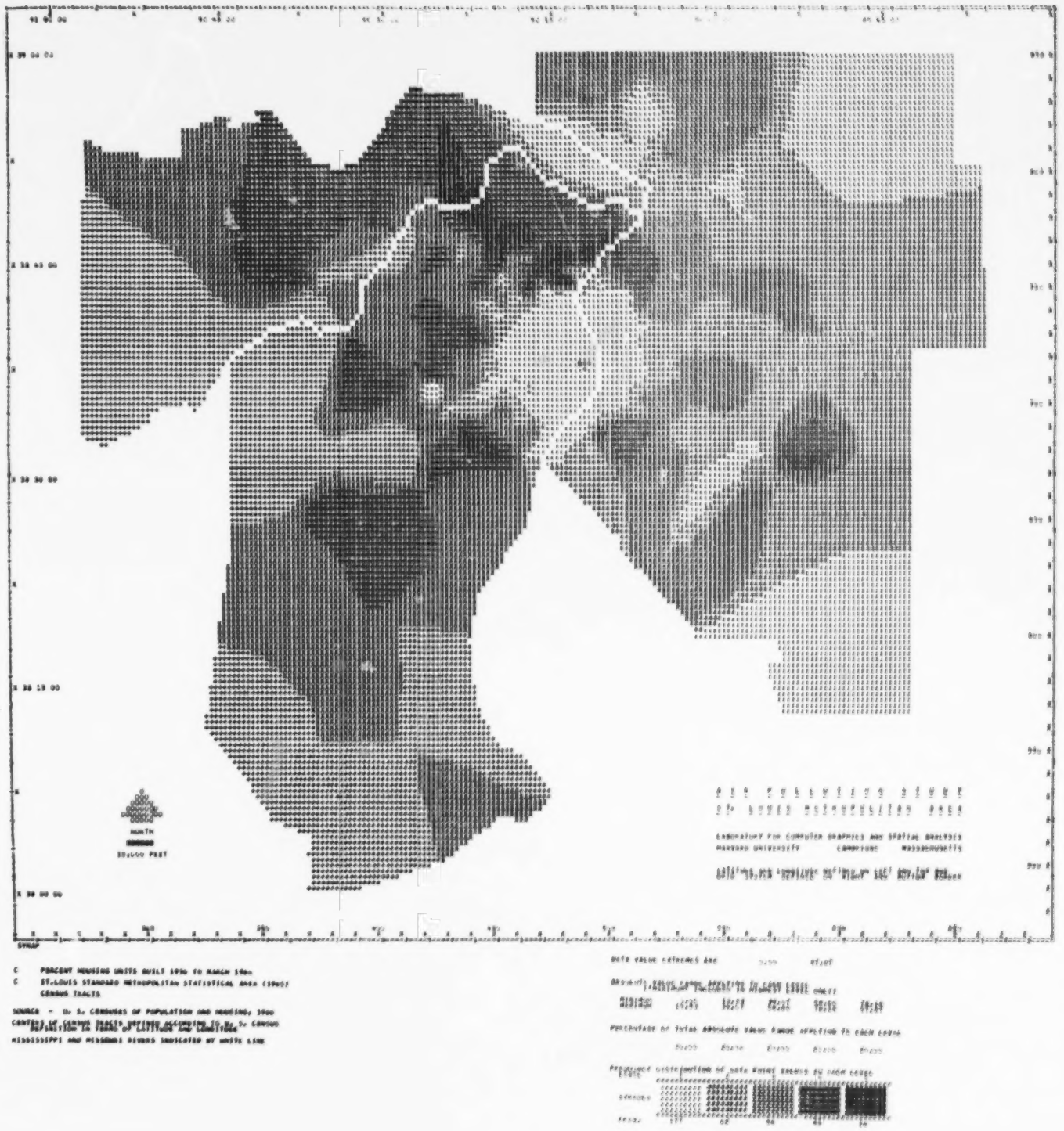
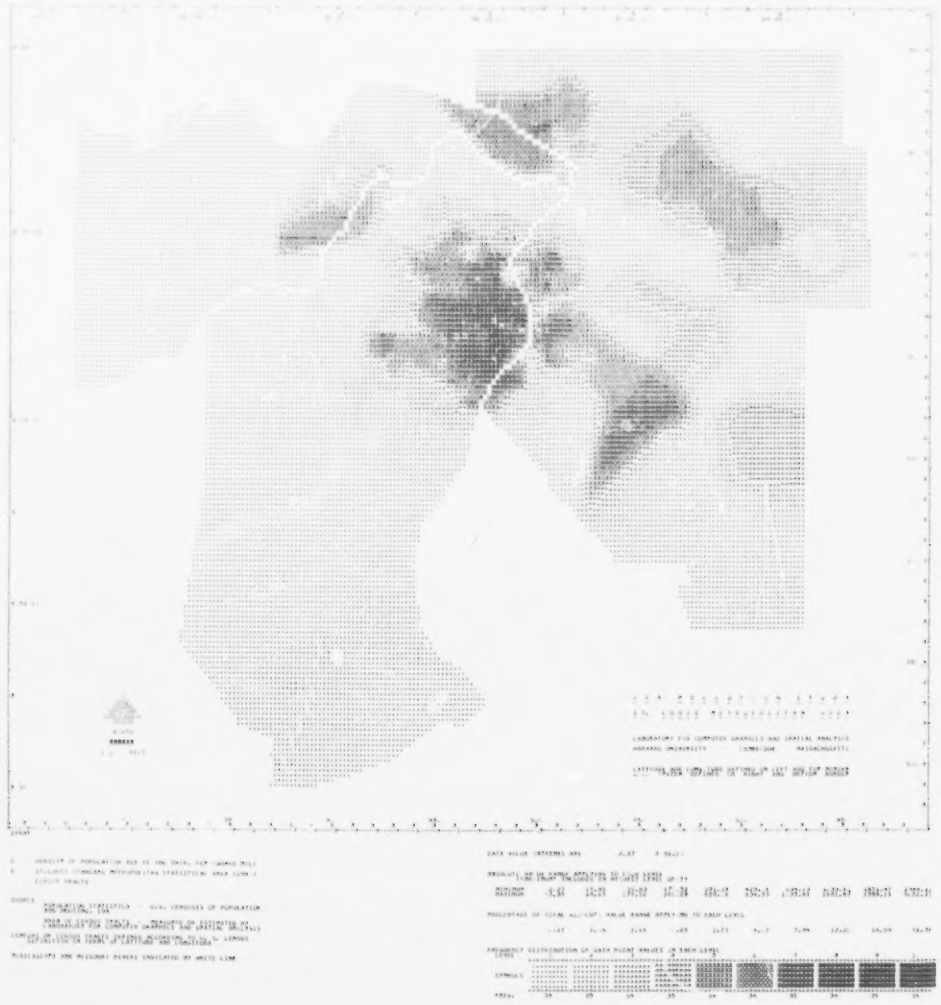


FIGURE B-25

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
Percent of Housing Built 1950-1960



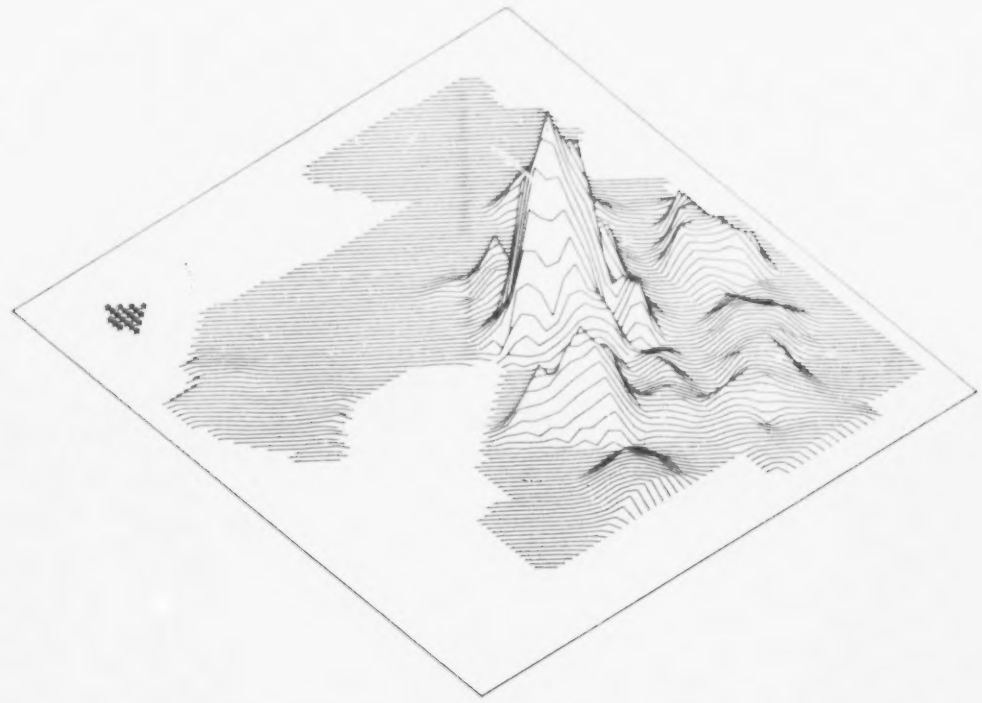


FIGURE B-26

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
a. Density of Population over 65 Years of Age
b. Oblique View of Same

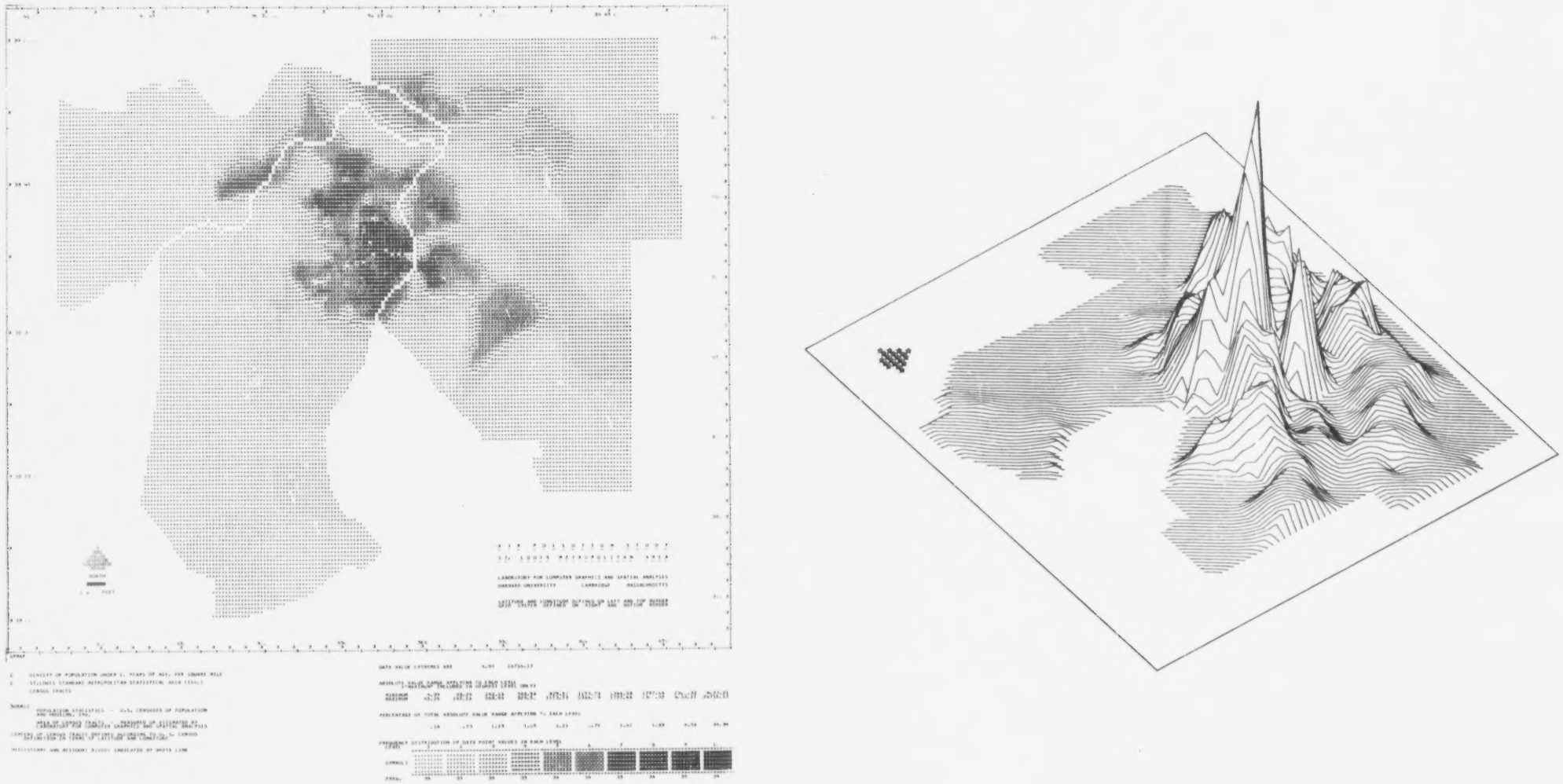


FIGURE B-27

ST. LOUIS REGION STUDY
Standard Metropolitan Statistical Area — 1960 Census
a. Density of Population under 10 Years of Age
b. Oblique View of Same

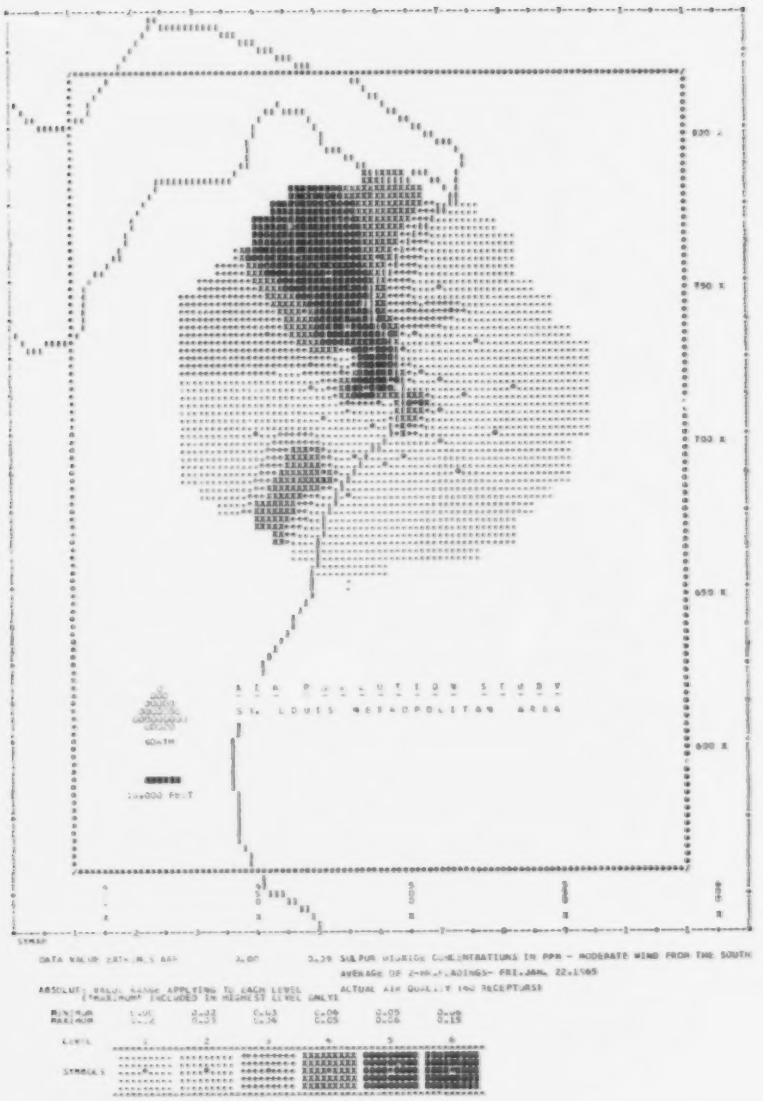


FIGURE C-1

ST. LOUIS REGION STUDY
Power Plant Study Area
Measured SO_2 Concentrations — 22 January 1965

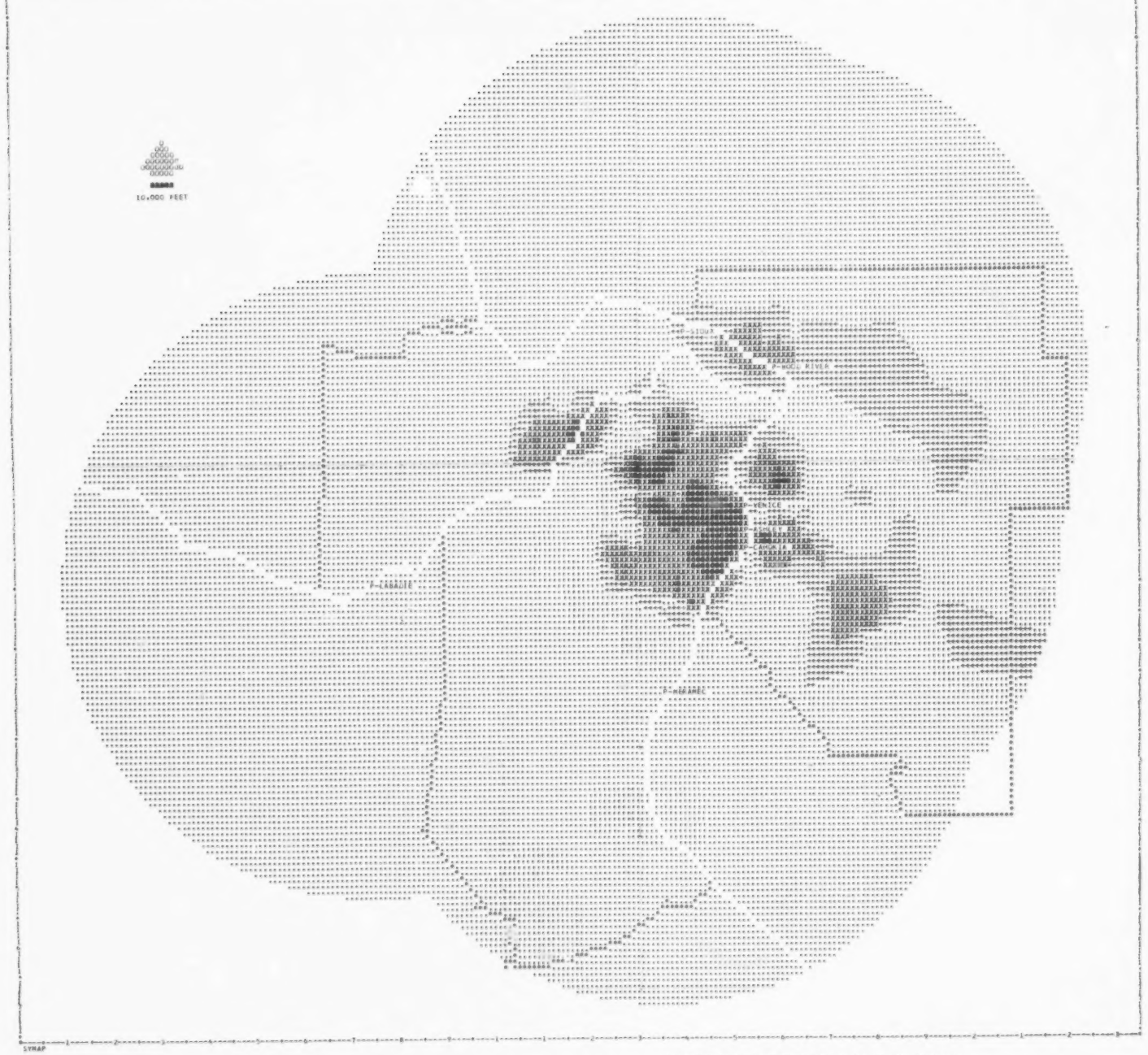
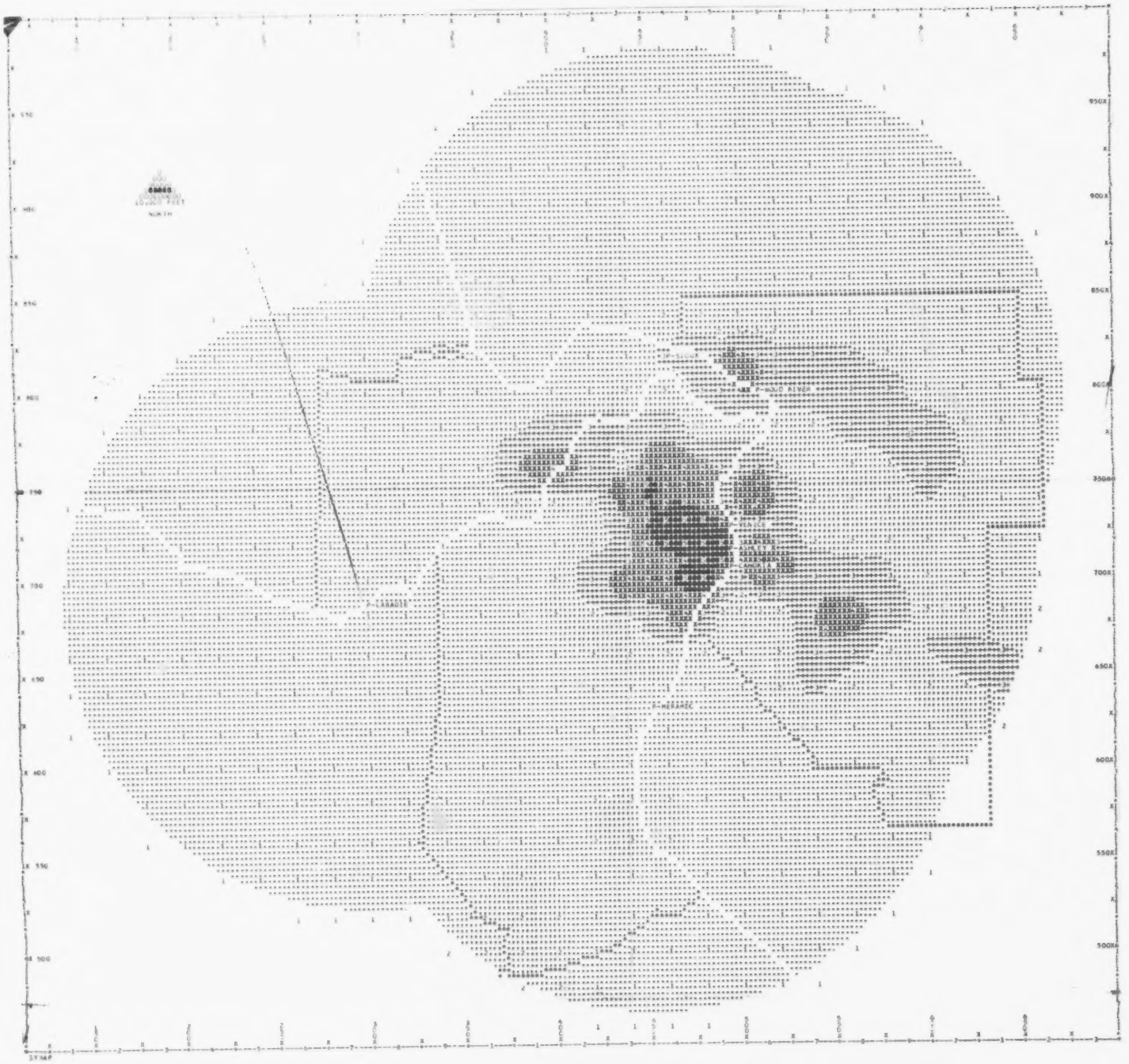


FIGURE C-2

ST. LOUIS REGION STUDY
Power Plant Study Area
Projected 1970 Population Density
Mapped by Census Tracts



POPULATION DENSITY, PROJECTED 1970, POPULATION PER SQUARE MILE
BASED ON 1960 CENSUS TRACTS AND 1970 COUNTY PROJECTIONS BY
THE EAST-WEST GATEWAY COORDINATING COUNCIL, ST LOUIS AREA

SOURCE - U. S. CENSUSES OF POPULATION AND HOUSING, 1960
CENTERS OF CENSUS TRACTS DEFINED ACCORDING TO U. S. CENSUS
DEFINITION IN TERMS OF LATITUDE AND LONGITUDE
MISSISSIPPI AND MISSOURI RIVERS INDICATED BY WHITE LINE

DATA VALUE EXTREMES ARE 17.62 10102.93

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
(*MAXIMUM* INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	500.00	2000.00	5000.00	10000.00	20000.00
MAXIMUM	500.00	2000.00	5000.00	10000.00	20000.00	70000.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

	0.71	2.14	4.29	7.14	14.29	71.43

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5	6
SYMBOLS						
FREQ.	420	72	60	66	10	8

FIGURE C-3

ST. LOUIS REGION STUDY
Power Plant Study Area
Projected 1970 Population Density
Mapped by Grid Coordinates

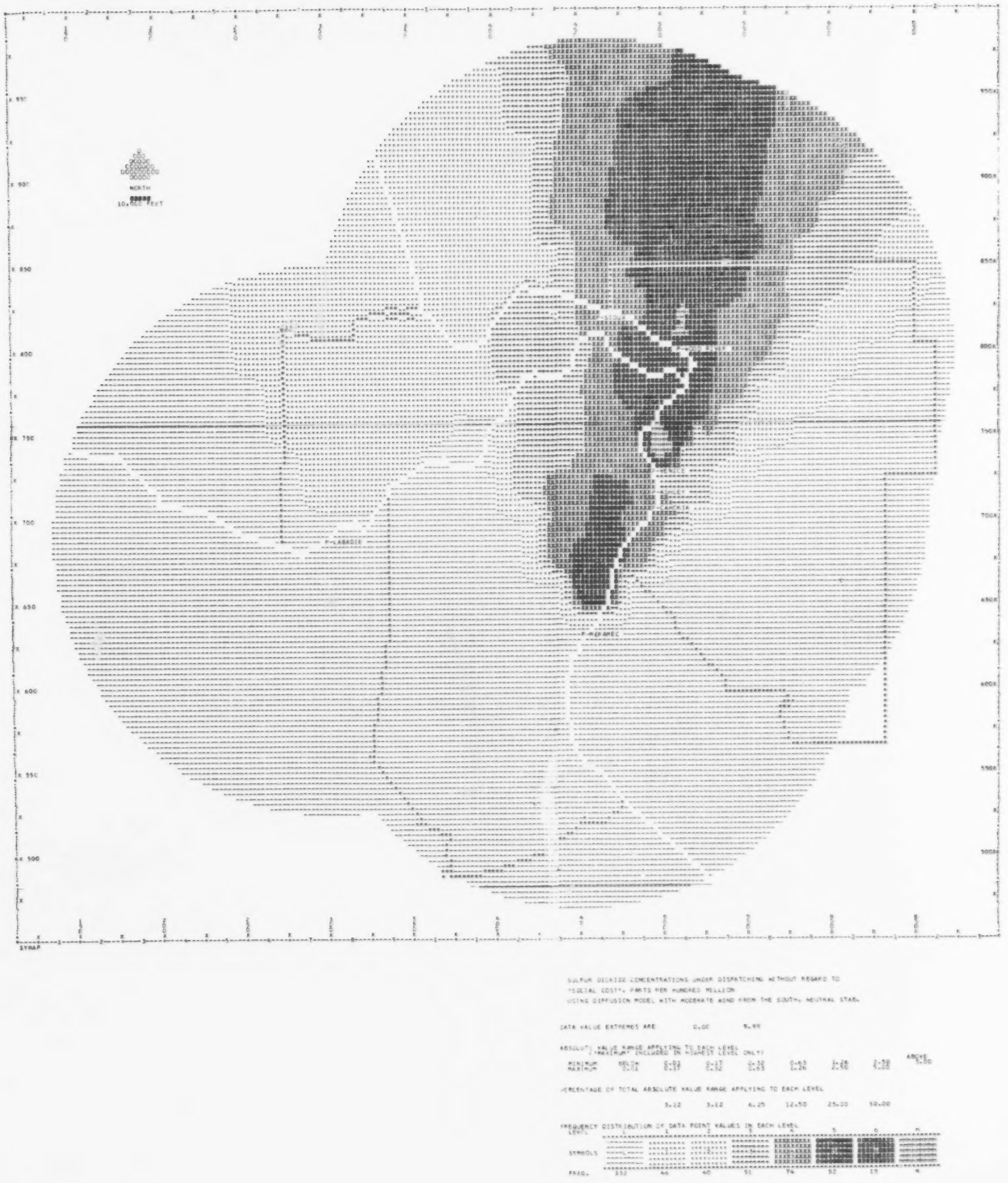
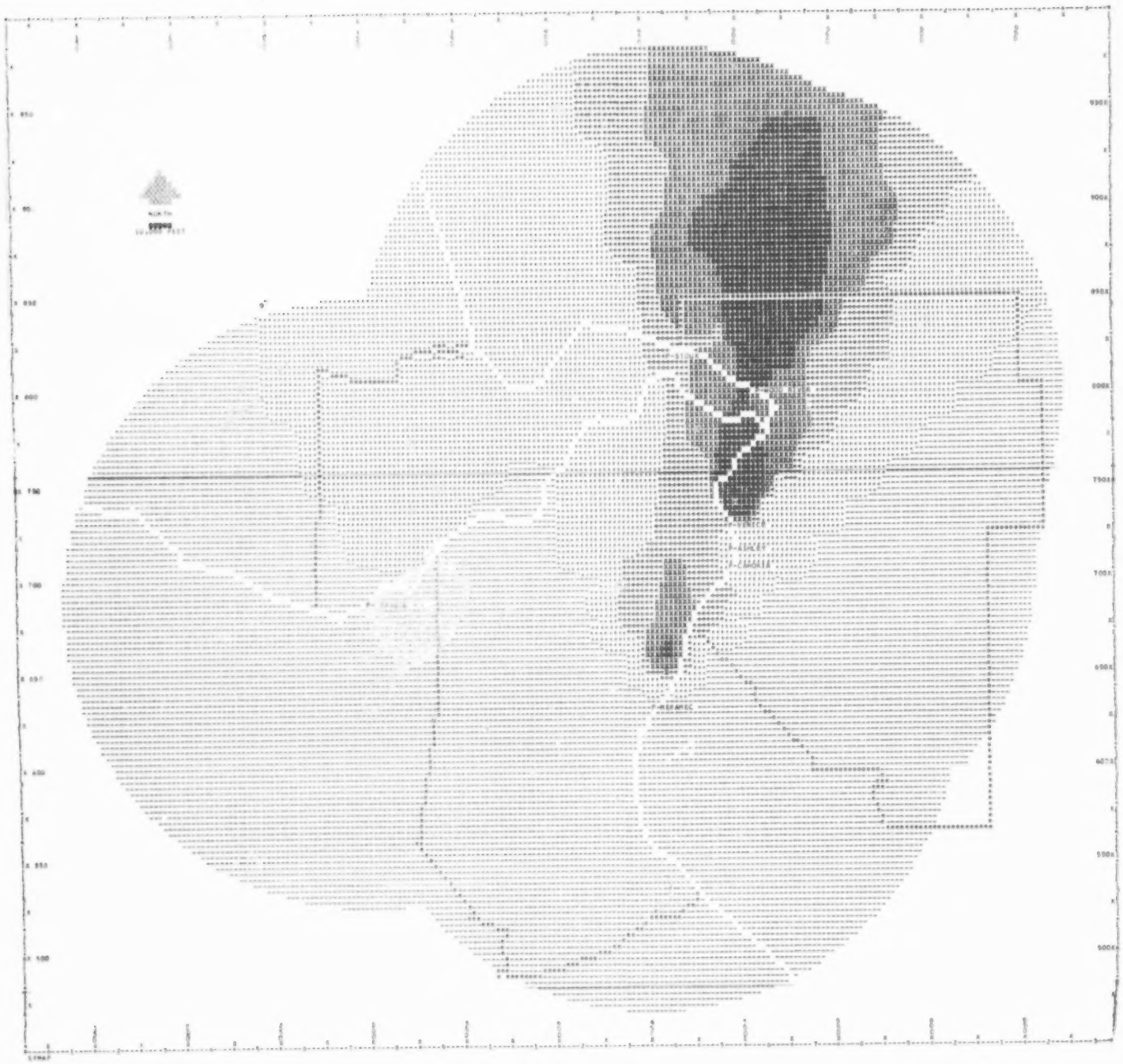


FIGURE C-4

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Moderate Winds from South
SO_2 Concentrations without Regard to "Social Cost"



SULFUR DIOXIDE CONCENTRATIONS FOR MINIMAL EXPOSURE -- ST LOUIS, PPMW
BASED ON OPTIMAL DISPATCHING OF ELECTRIC POWER STATIONS, 1970
USING DIFFUSION MODEL WITH MODERATE WIND FROM THE SOUTH, NEUTRAL STAB.

DATA VALUE EXTREMES ARE 0.00 5.74

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
(MAXIMUM INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	BELOW	0.01	0.17	0.32	0.63	1.26	2.50	ABOVE 5.00
MAXIMUM	0.01	0.17	0.32	0.63	1.26	2.50	5.00	

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

3.12 3.12 4.25 12.90 25.00 50.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5	6	7
SYMBOLS							
FREQ.	332	89	50	61	48	24	7

FIGURE C-5

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Moderate Winds from South
SO_2 Concentrations for Minimal Exposure

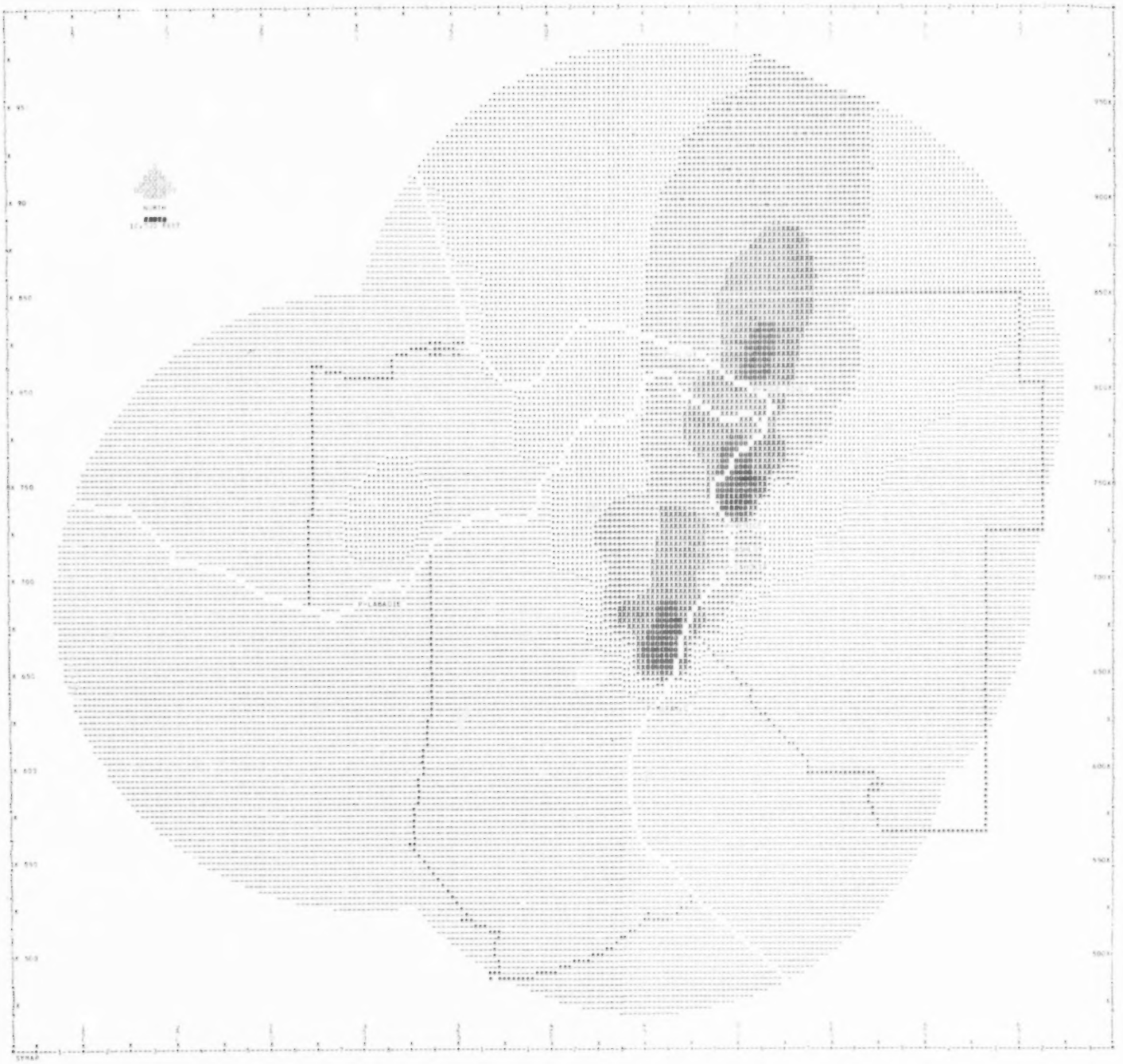


FIGURE C-6

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Moderate Winds from South
Improvement in SO_2 through "Social Cost" Dispatching

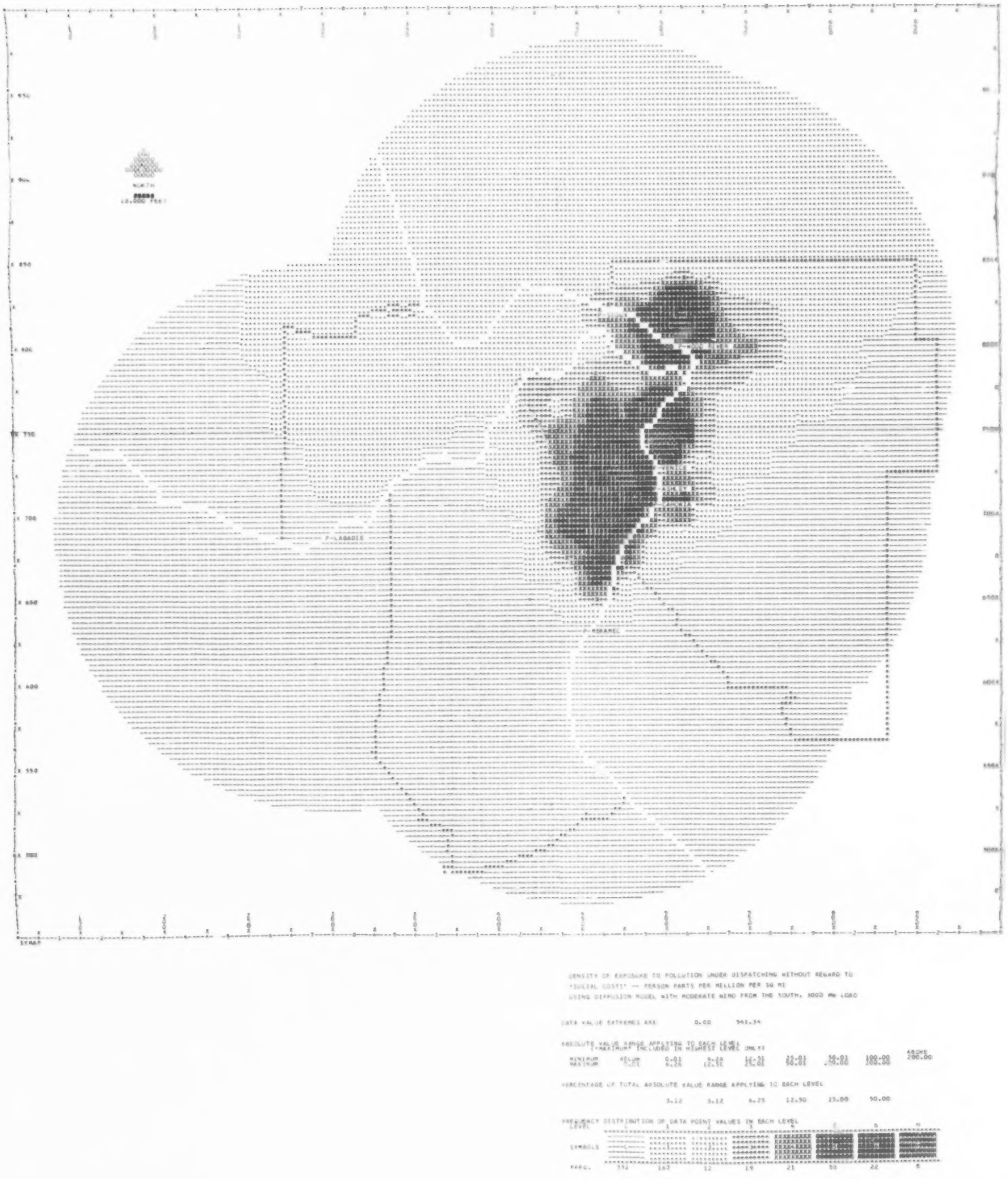


FIGURE C-7

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Moderate Winds from South
Density of Exposure to Pollution without Regard to "Social Cost"

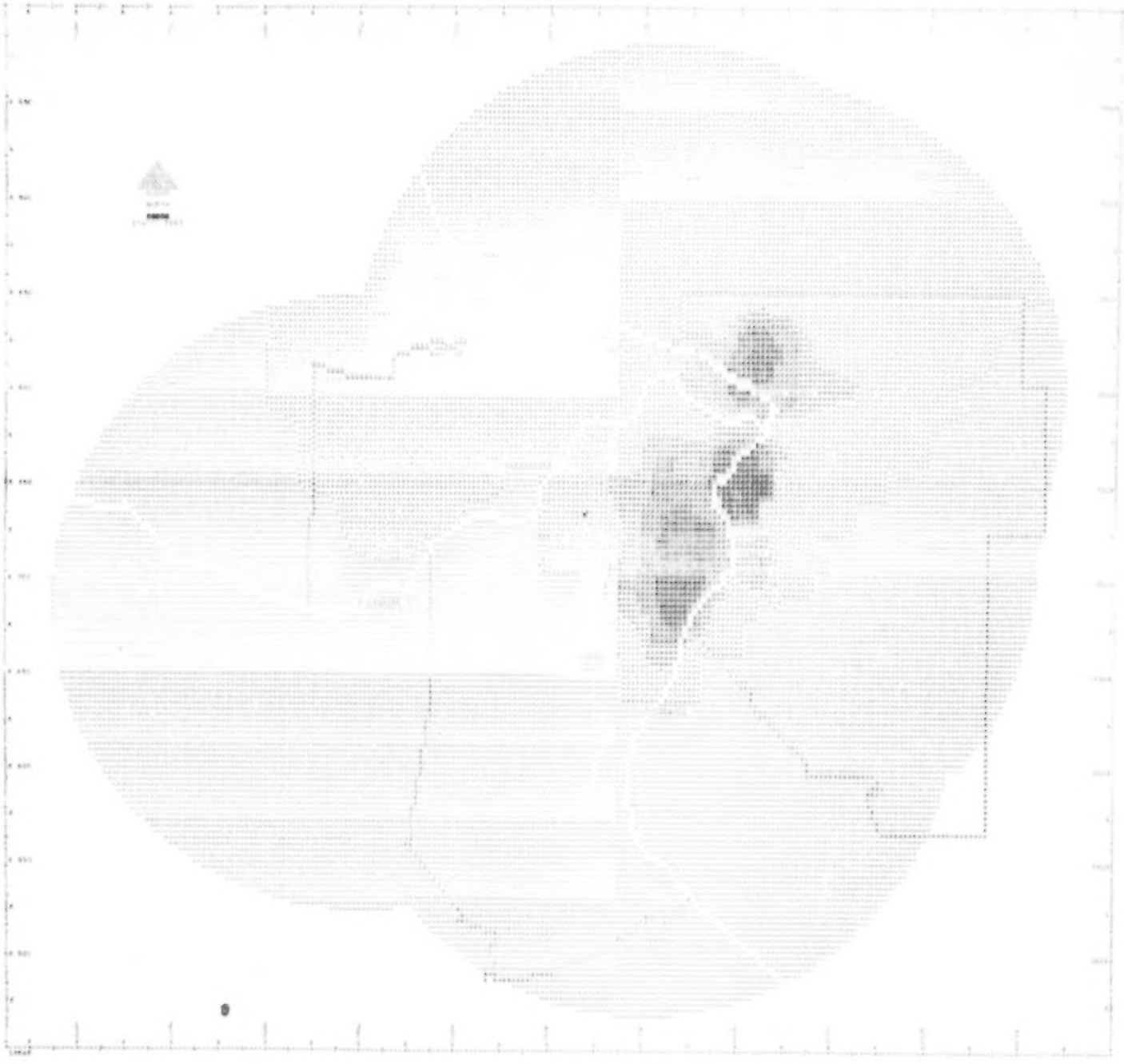


FIGURE C-8

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Moderate Winds from South

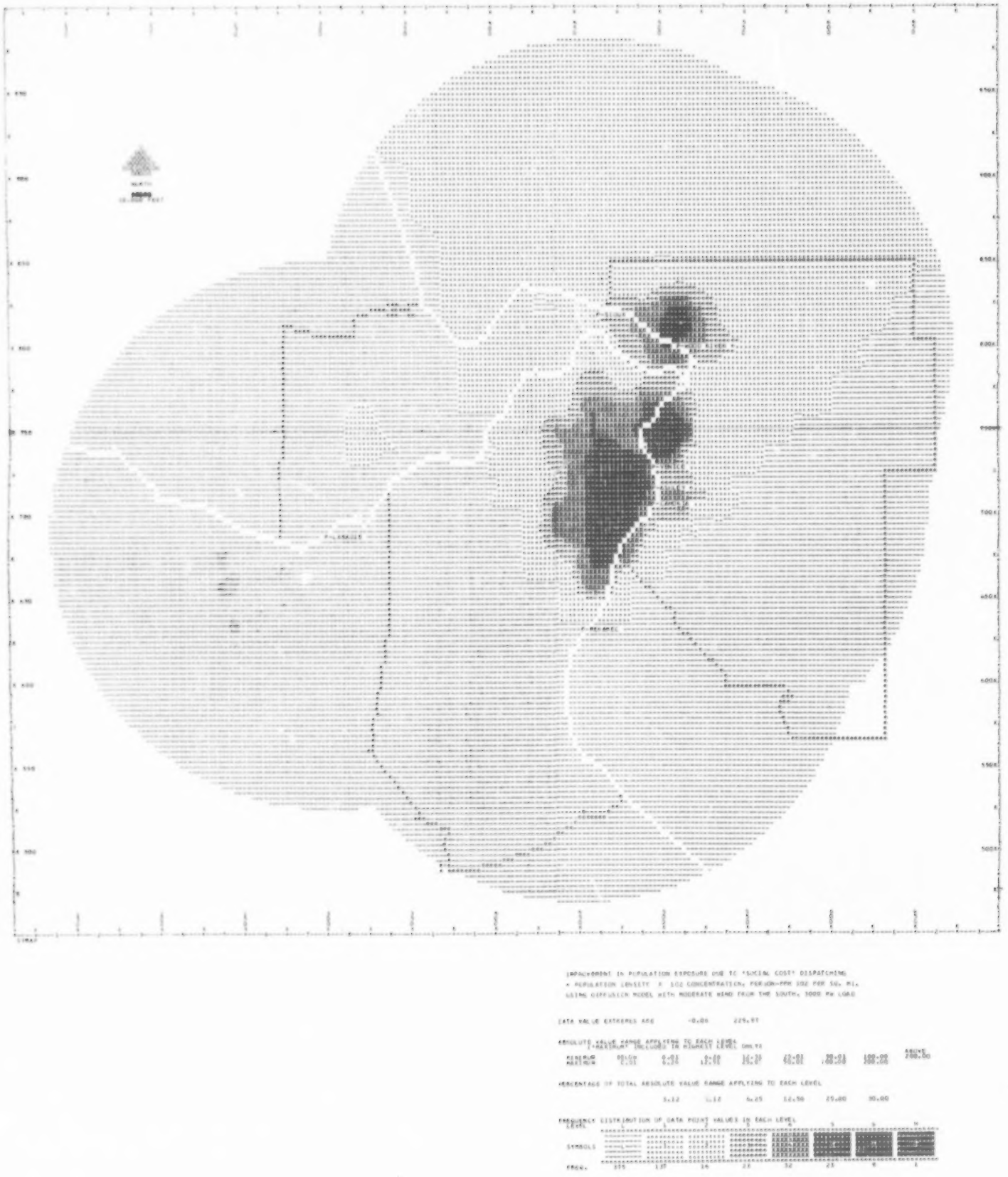


FIGURE C-9

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Moderate Winds from South
Improvement in Population Exposure through "Social Cost" Dispatching

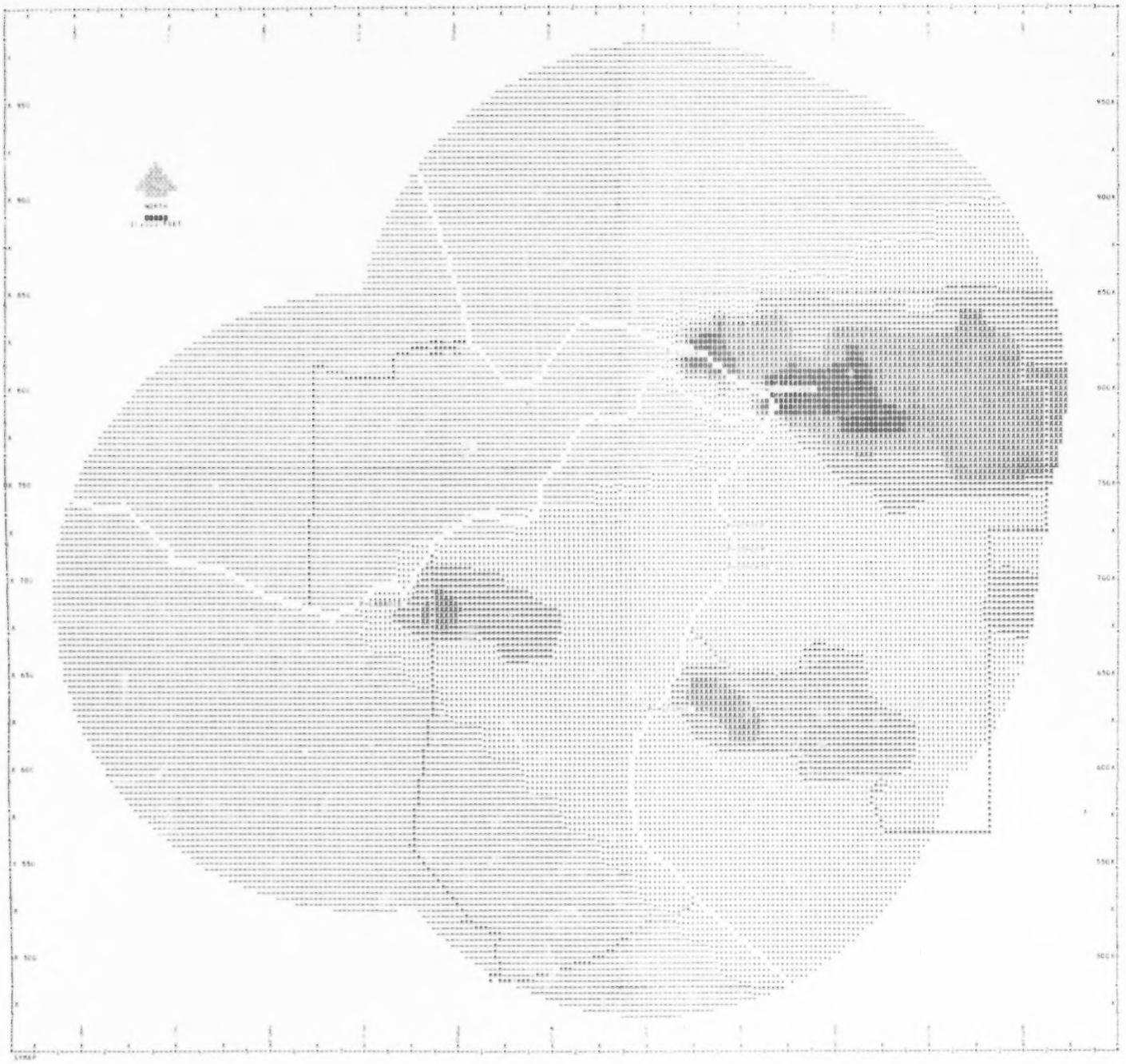


FIGURE C-10

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Light Winds from West
SO_2 Concentrations without Regard to "Social Cost"

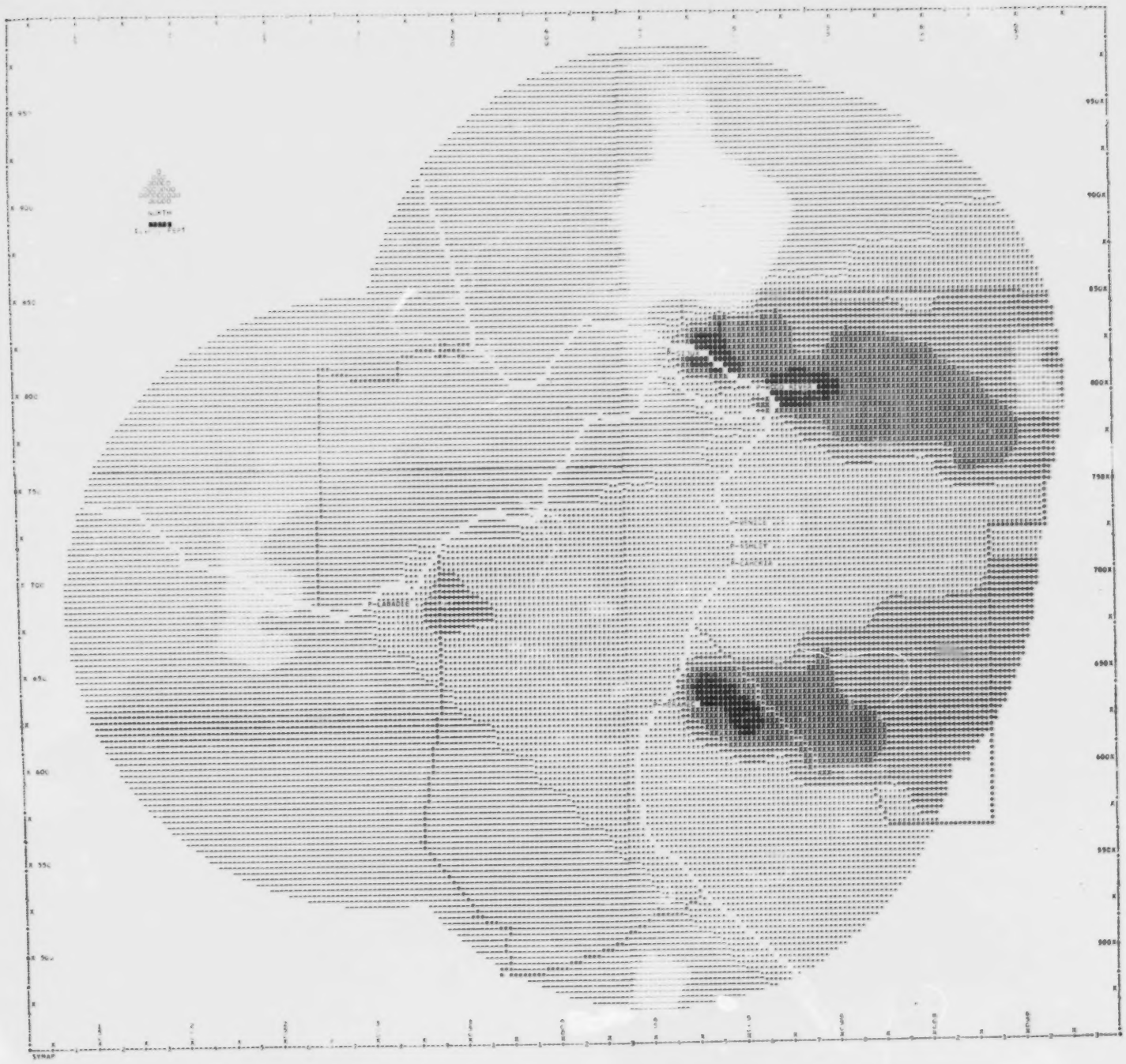
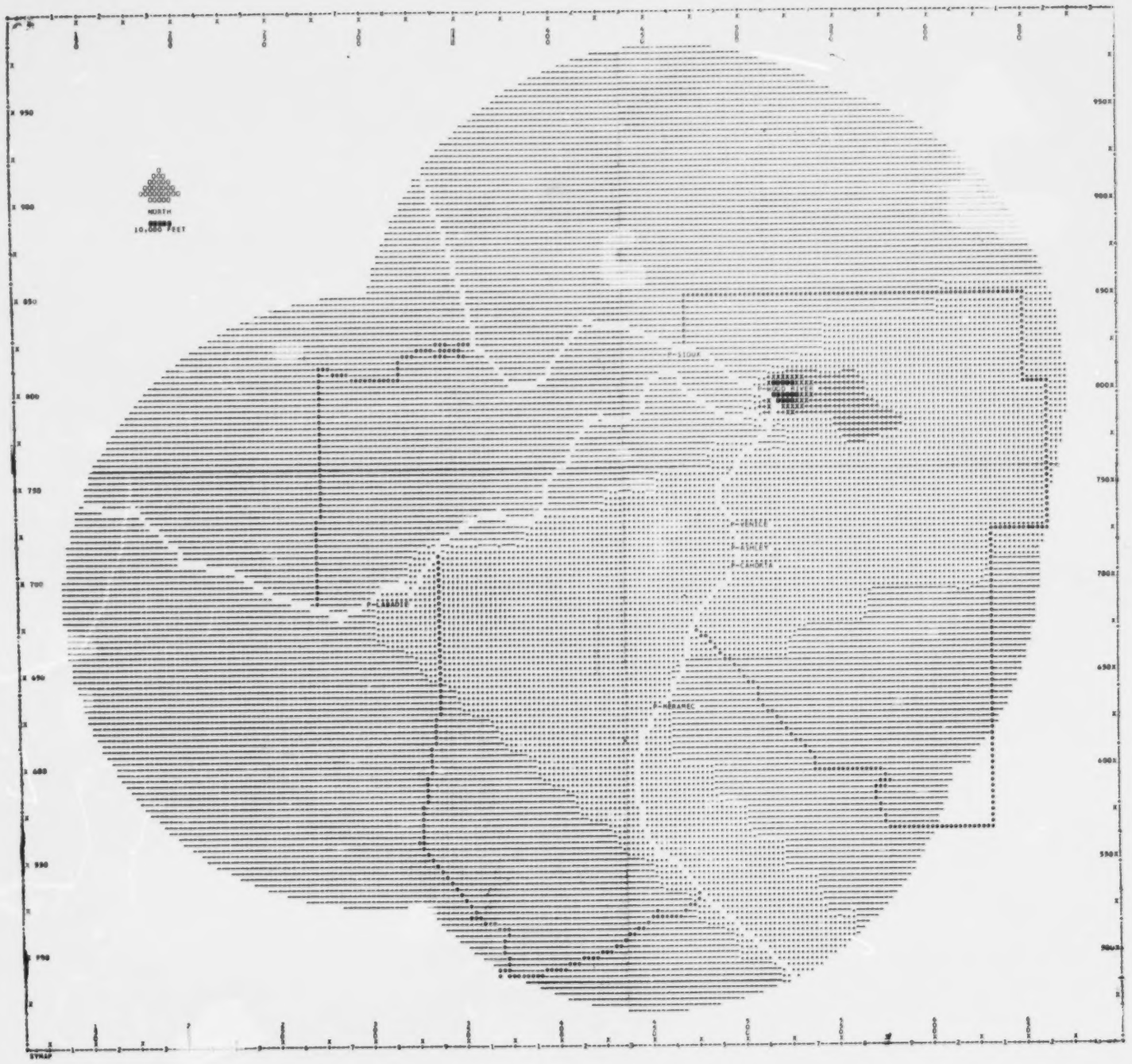


FIGURE C-11

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Light Winds from West
SO_2 Concentrations without Regard to "Social Cost"



IMPROVEMENT IN AIR POLLUTION RESULTING FROM 'SOCIAL COST' DISPATCHING
SULFUR DIOXIDE CONCENTRATIONS IN PARTS PER HUNDRED MILLION
USING DIFFUSION MODEL WITH LIGHT WIND FROM WEST, UNSTABLE. 2000 MW.

DATA VALUE EXTREMES ARE -0.95 2.52

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	BELOW	0.01	0.17	0.32	0.63	1.26	2.50
MAXIMUM	0.01	0.17	0.32	0.63	1.26	2.50	5.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

3.12	3.12	6.25	12.50	25.00	50.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5	6
SYMBOLS	L	1	2	3	4	5
FREQ.	425	167	17	4	0	0	1

FIGURE C-12

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Light Winds from West
Improvement in SO_2 through "Social Cost" Dispatching

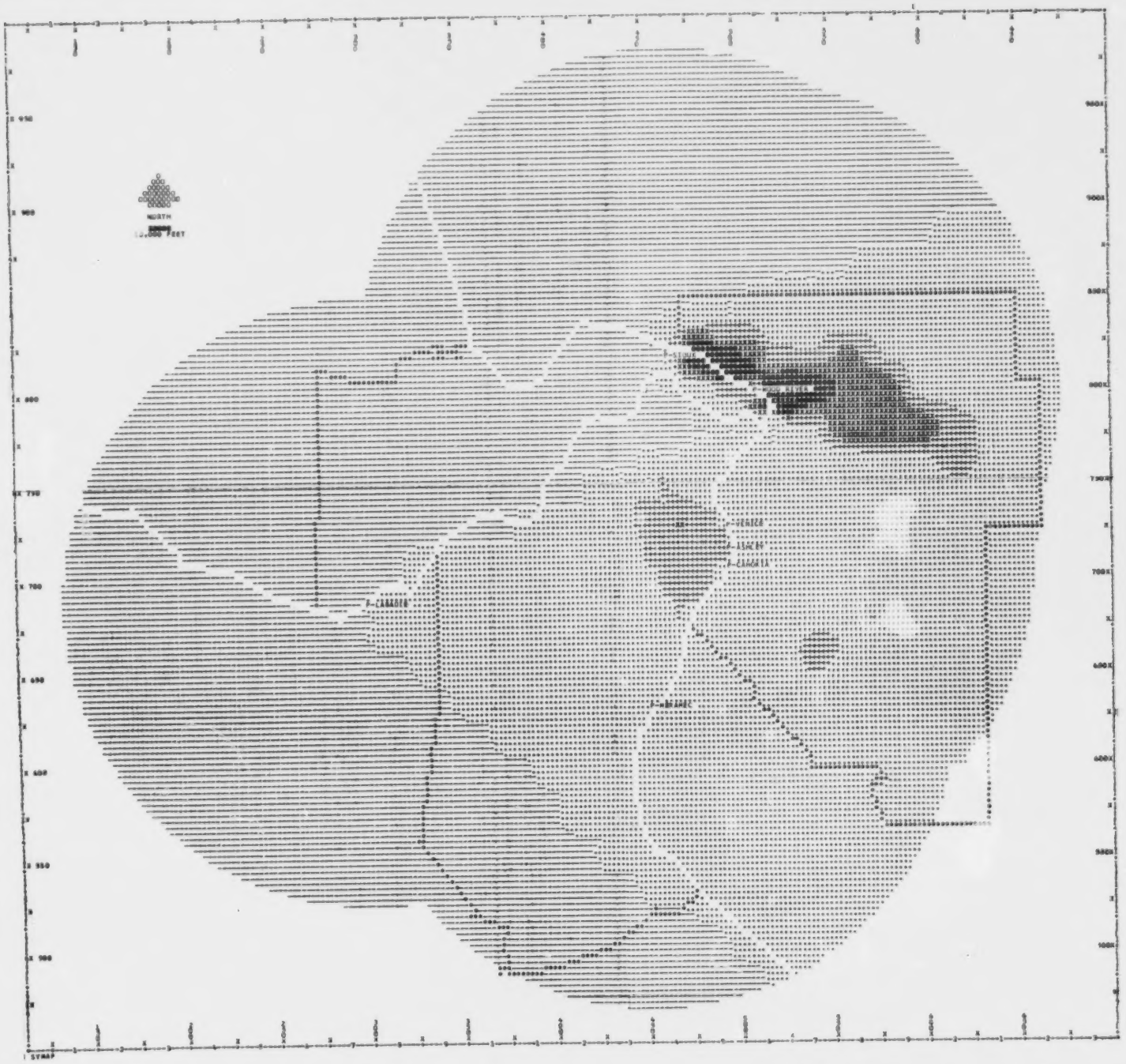


FIGURE C-13

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Light Winds from West
Density of Exposure to Pollution without Regard tc "Social Cost"

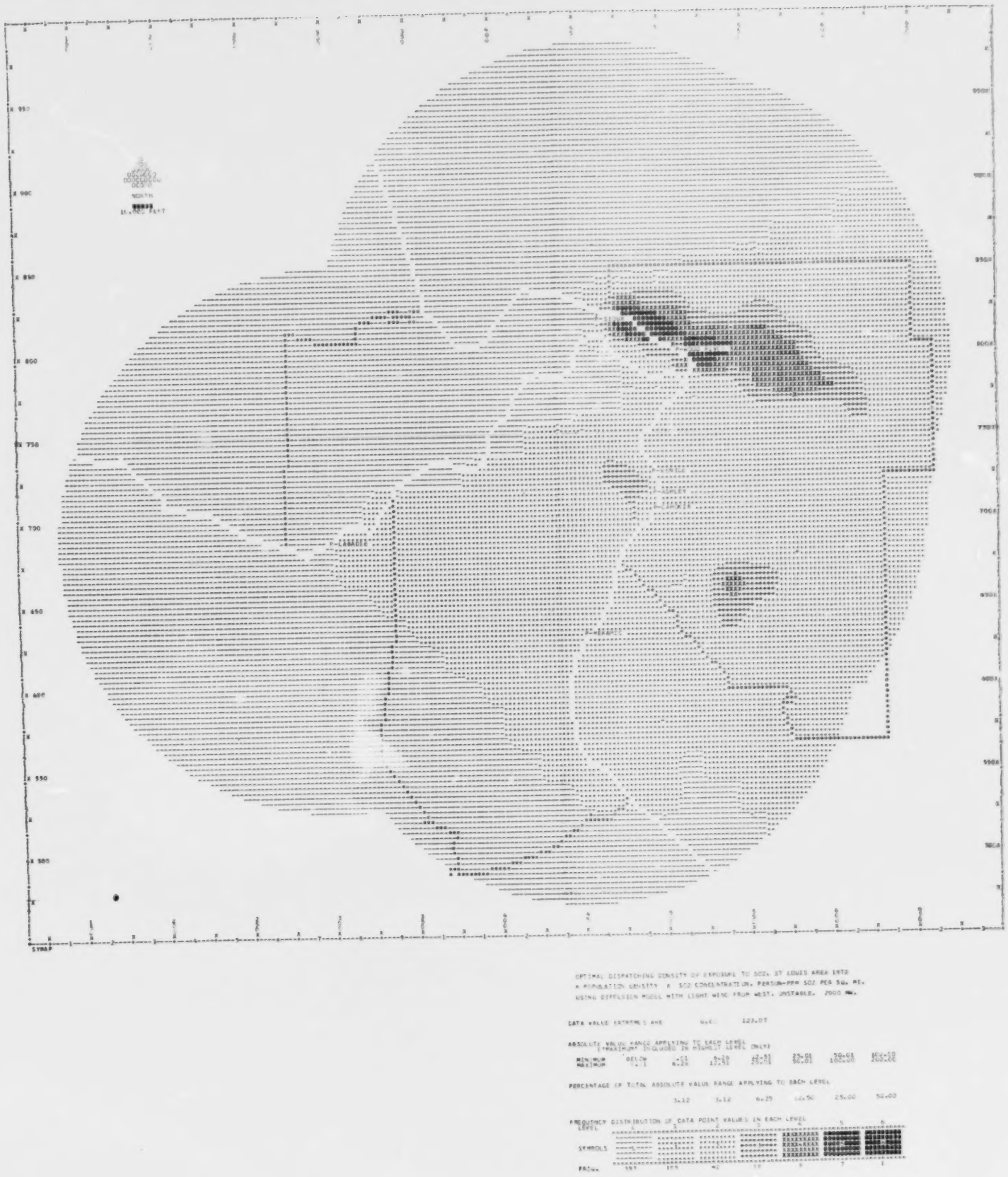


FIGURE C-14

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Light Winds from West
Optimal Dispatching Density of Exposure

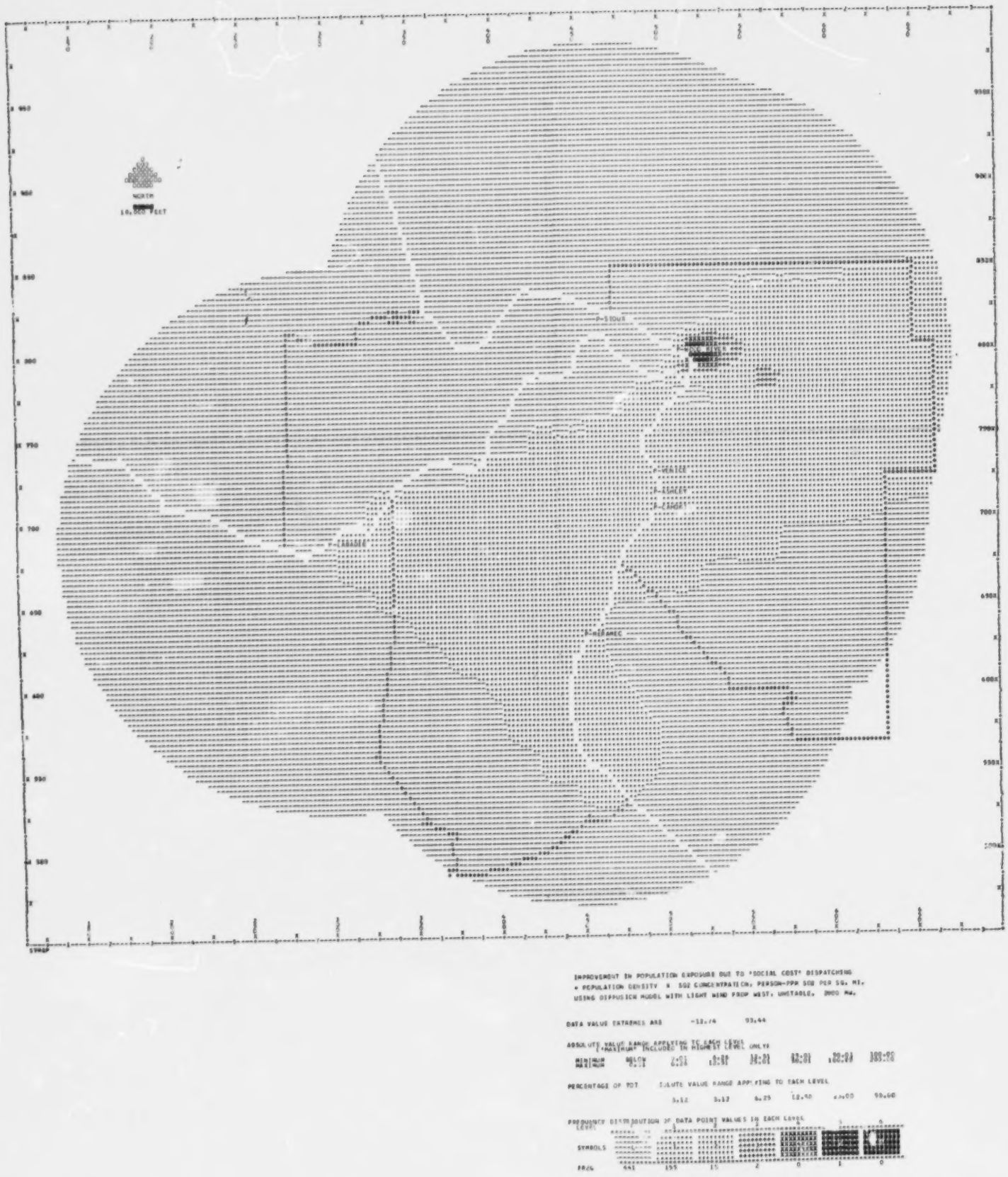
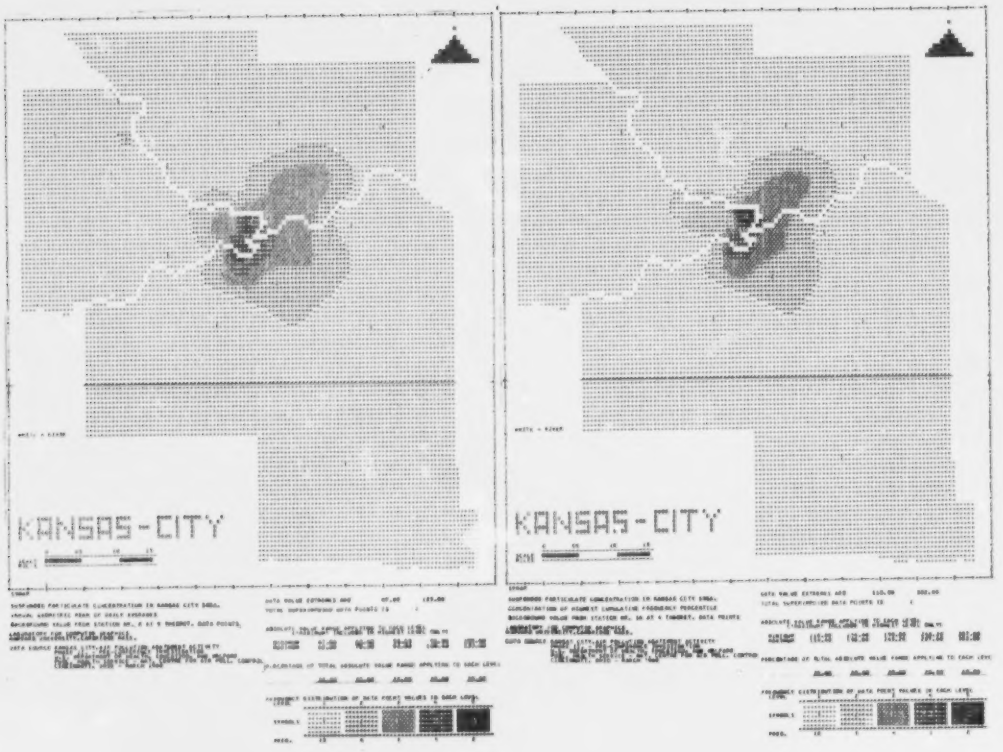


FIGURE C-15

ST. LOUIS REGION STUDY
Power Plant Study Area
Dispatching under Light Winds from West
Improvement in Population Exposure through "Social Cost" Dispatching



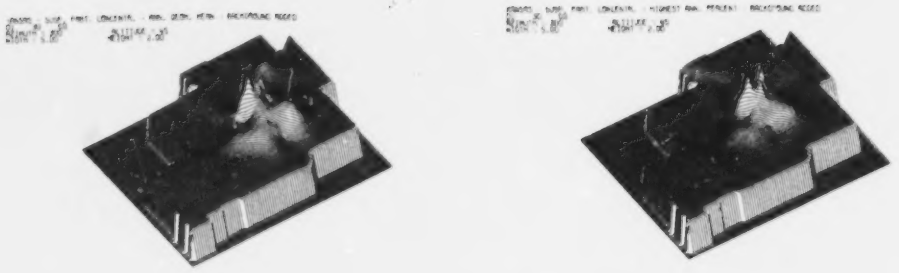
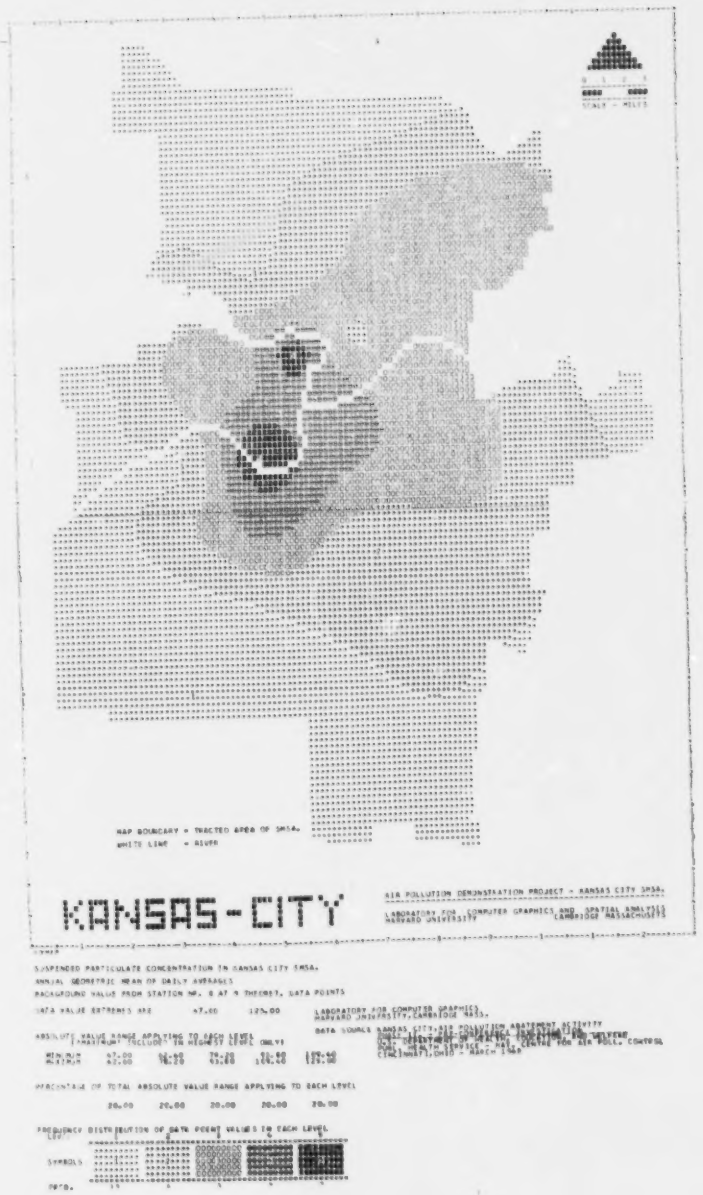


FIGURE D-1

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Suspended Particulate Concentration — Daily Averages
Background Values Added

a. Annual Geometric Mean b. Concentration of Highest Cumulative Frequency Percentile

c. Oblique View of a. d. Oblique View of b.



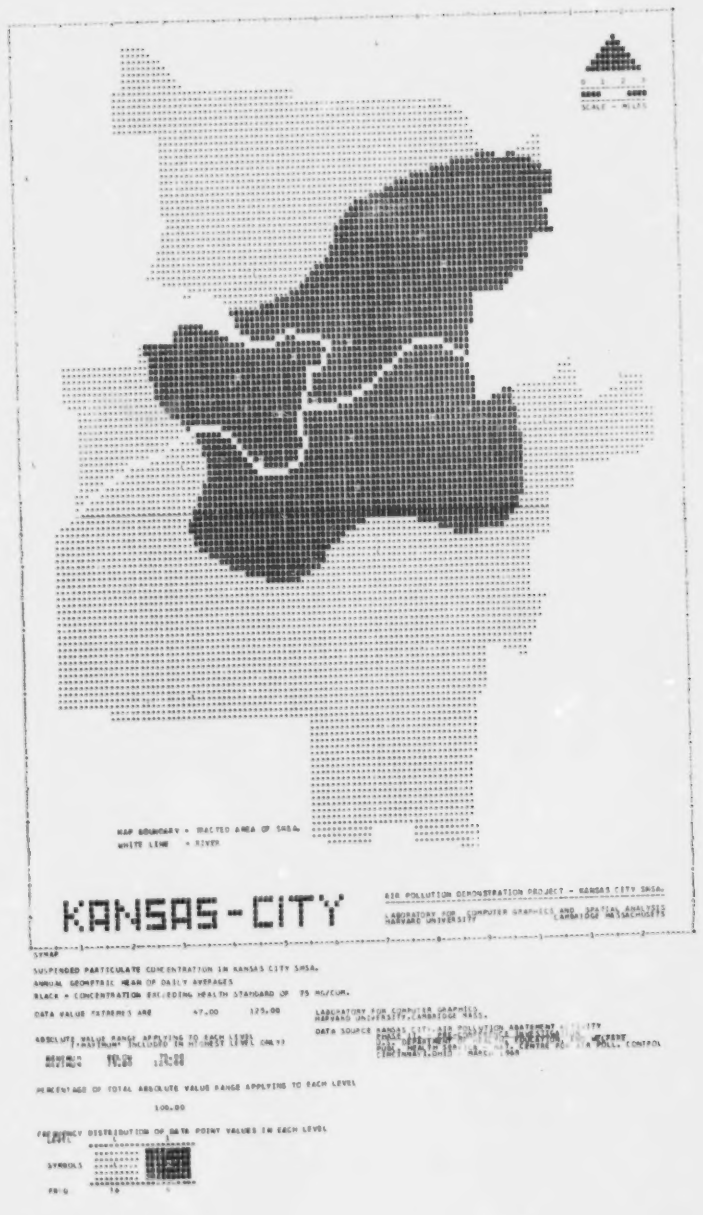
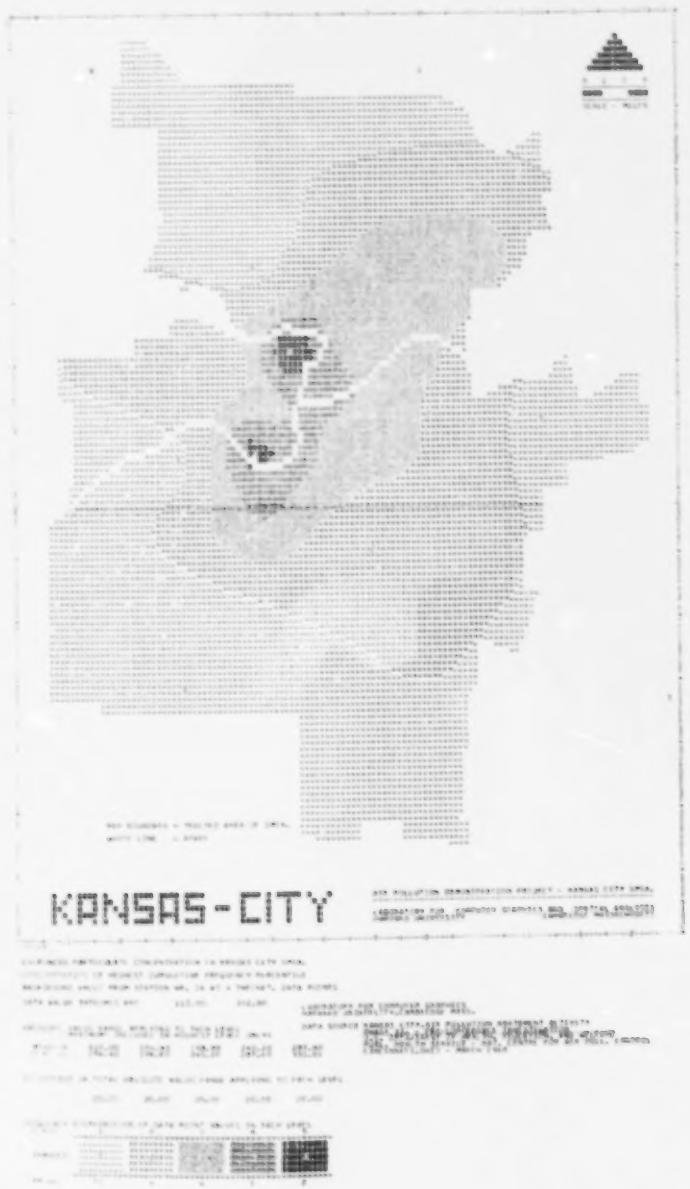


FIGURE D-2

KANSAS CITY REGION STUDY
Tracted Area of SMSA
Suspended Particulates — Daily Averages
Annual Geometric Mean
a. Background Values Added at 9 Locations
b. Concentration Exceeding Health Standard



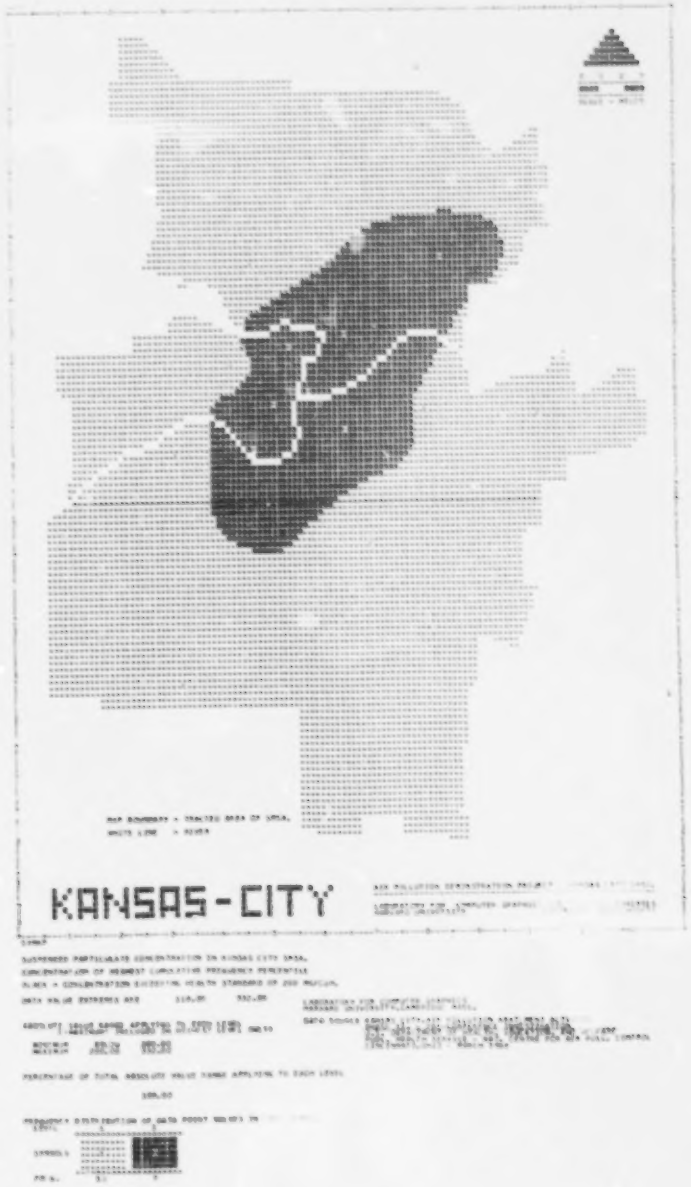
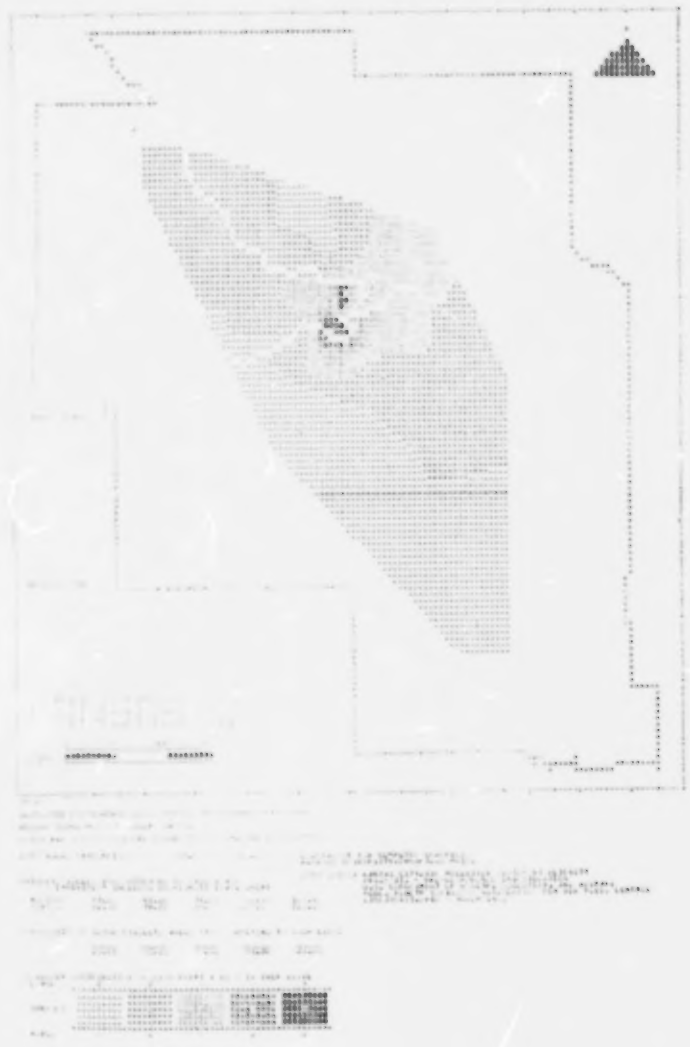


FIGURE D-3

KANSAS CITY REGION STUDY
Tracted Area of SMSA
Suspended Particulates — Daily Averages
Concentration of Highest Cumulative Frequency Percentile
a. Background Values Added at 4 Locations
b. Concentration Exceeding Health Standard



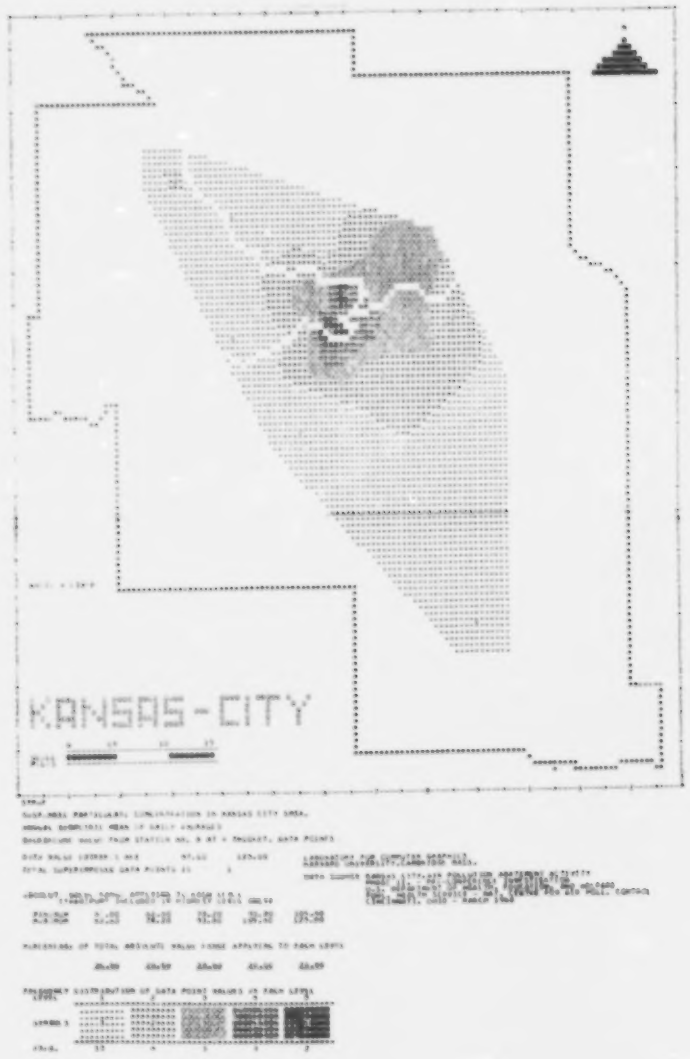


FIGURE D-4

KANSAS CITY REGION STUDY
Convex Area of Air Pollution Monitoring Stations
Suspended Particulates — Daily Averages
Annual Geometric Mean
a. Data from 16 Monitoring Stations
b. Background Values Added at 4 Locations

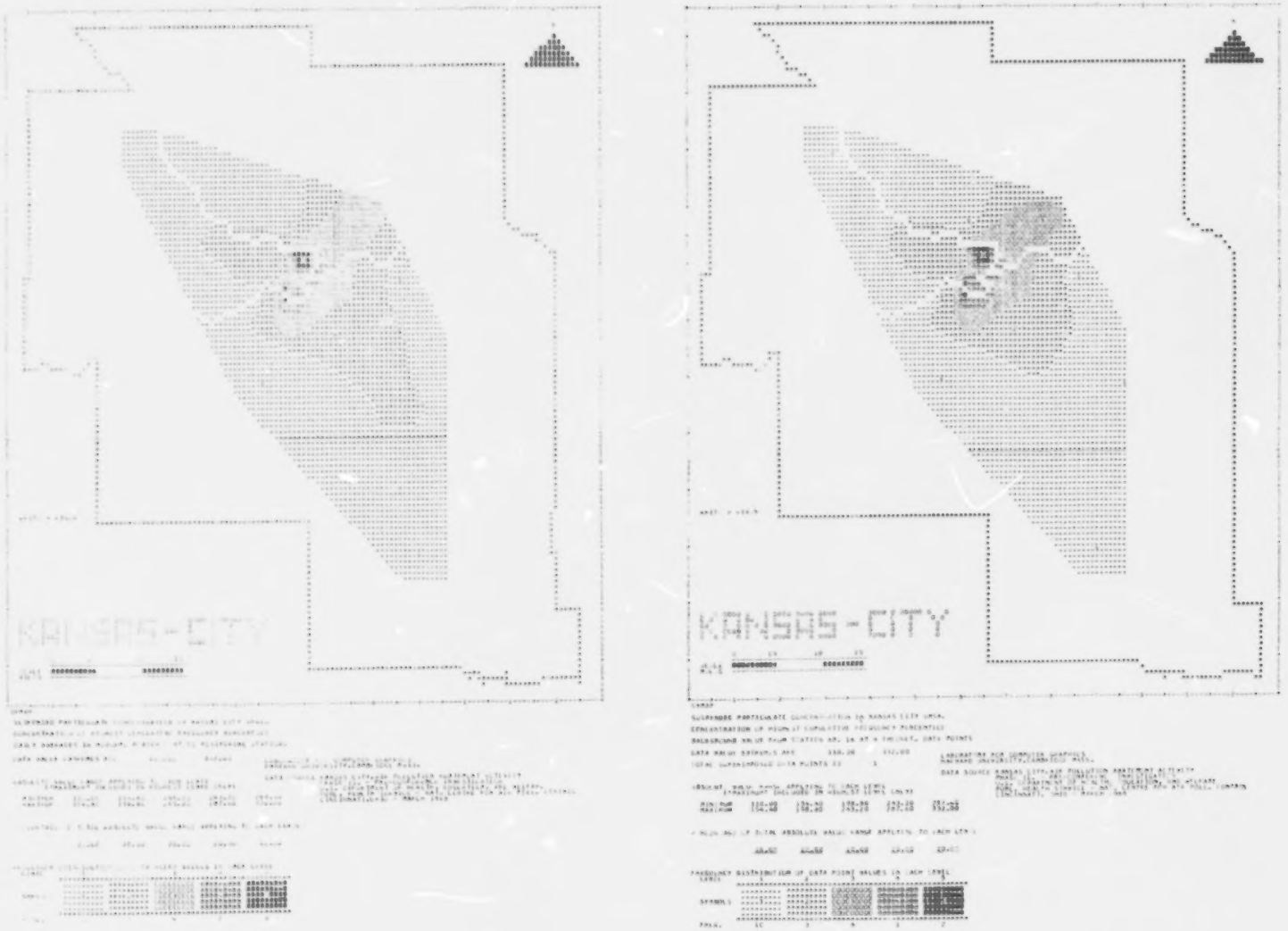


FIGURE D-5

KANSAS CITY REGION STUDY
Convex Area of Air Pollution Monitoring Stations
Suspended Particulates — Daily Averages
Concentration of Highest Cumulative Frequency Percentile
a. Data from 16 Monitoring Stations
b. Background Values Added at 4 Locations

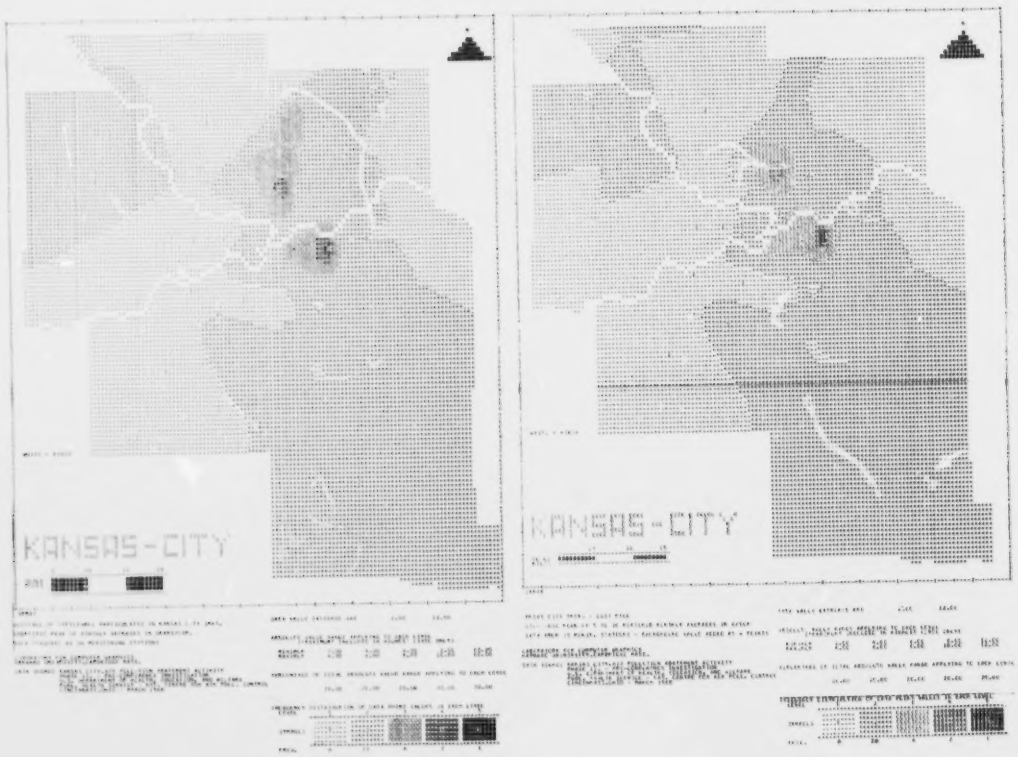


FIGURE D-6

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Dustfall of Settleable Particulates
Geometric Mean of Monthly Averages
a. Data Measured at 36 Monitoring Stations
b. Background Values Added at 4 Points
c. Oblique View of a. d. Oblique View of b.

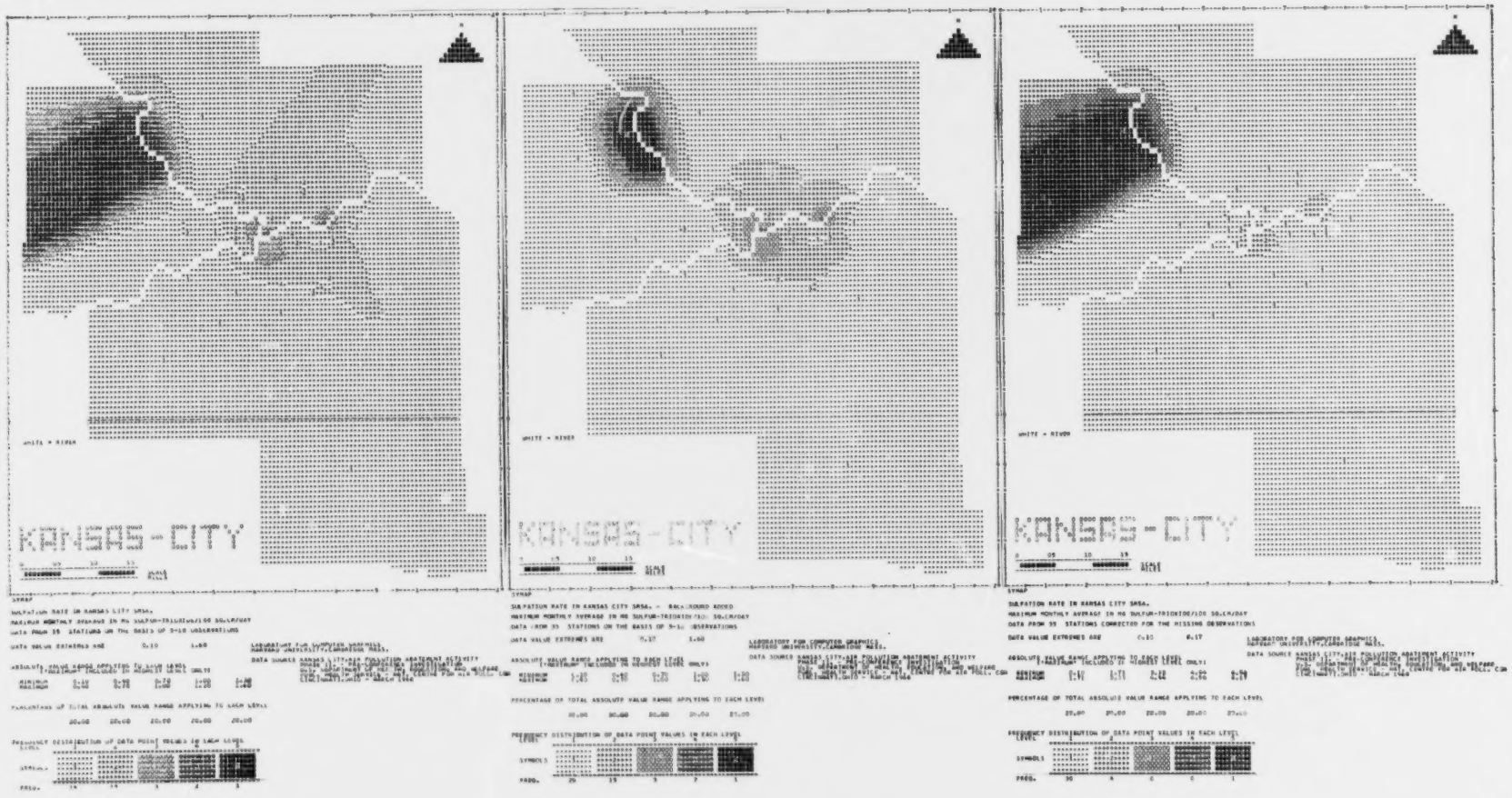


FIGURE D-7

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Sulfation Rate — Maximum Monthly Average
a. Data from 35 Stations
b. Background Added
c. Corrected for Missing Observations

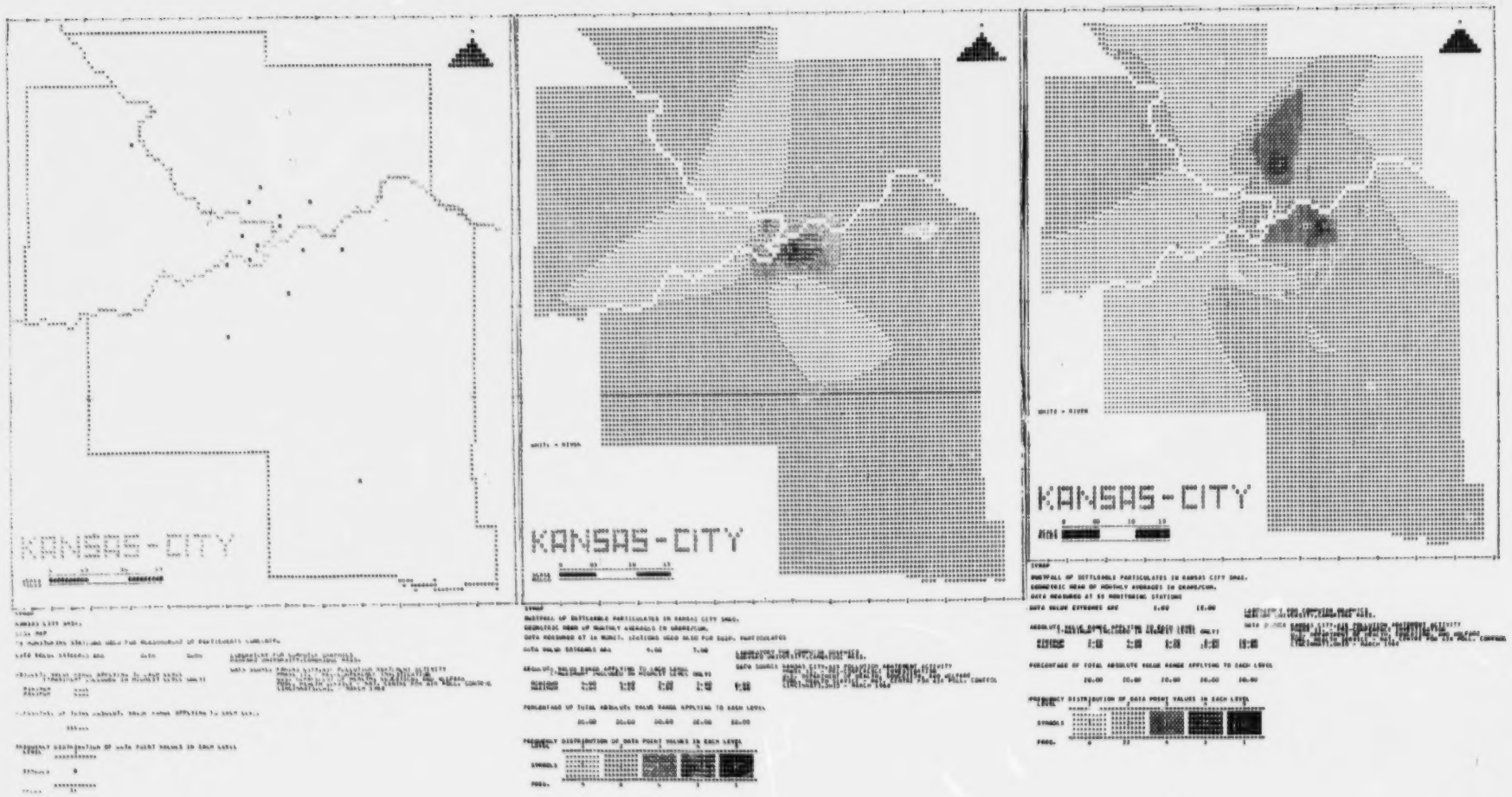


FIGURE D-8

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Dustfall of Settleable Particulates
Geometric Mean of Monthly Averages
a. Base Map of Monitoring Stations
b. Data Measured at 16 Monitoring Stations
c. Data Measured at 35 Monitoring Stations

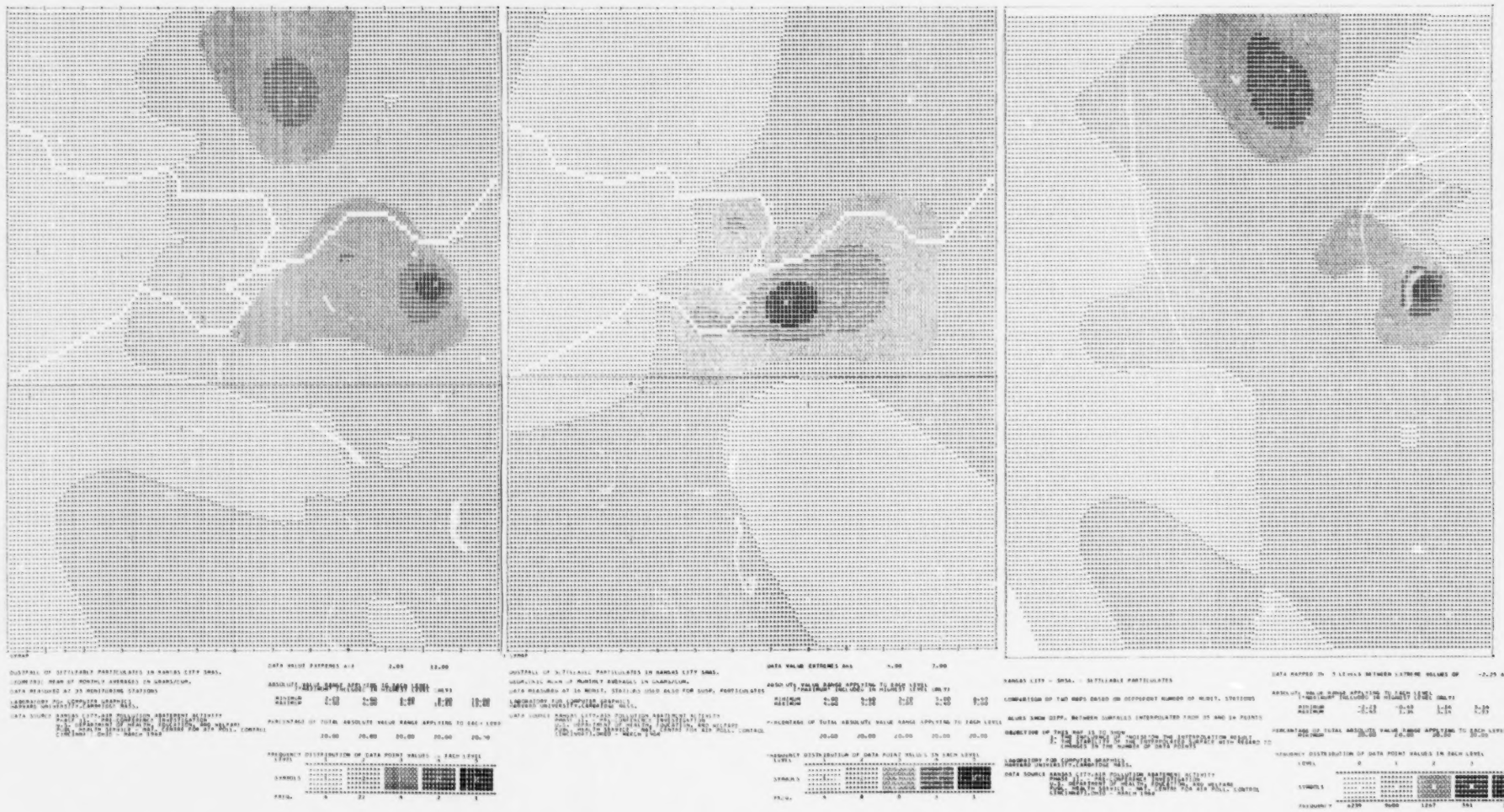


FIGURE D-9

KANSAS CITY REGION STUDY
Dustfall of Settleable Particulates
Geometric Mean of Monthly Averages
a. Data Measured at 35 Monitoring Stations
b. Data Measured at 16 Monitoring Stations
c. Comparison of Surfaces from a. and b.

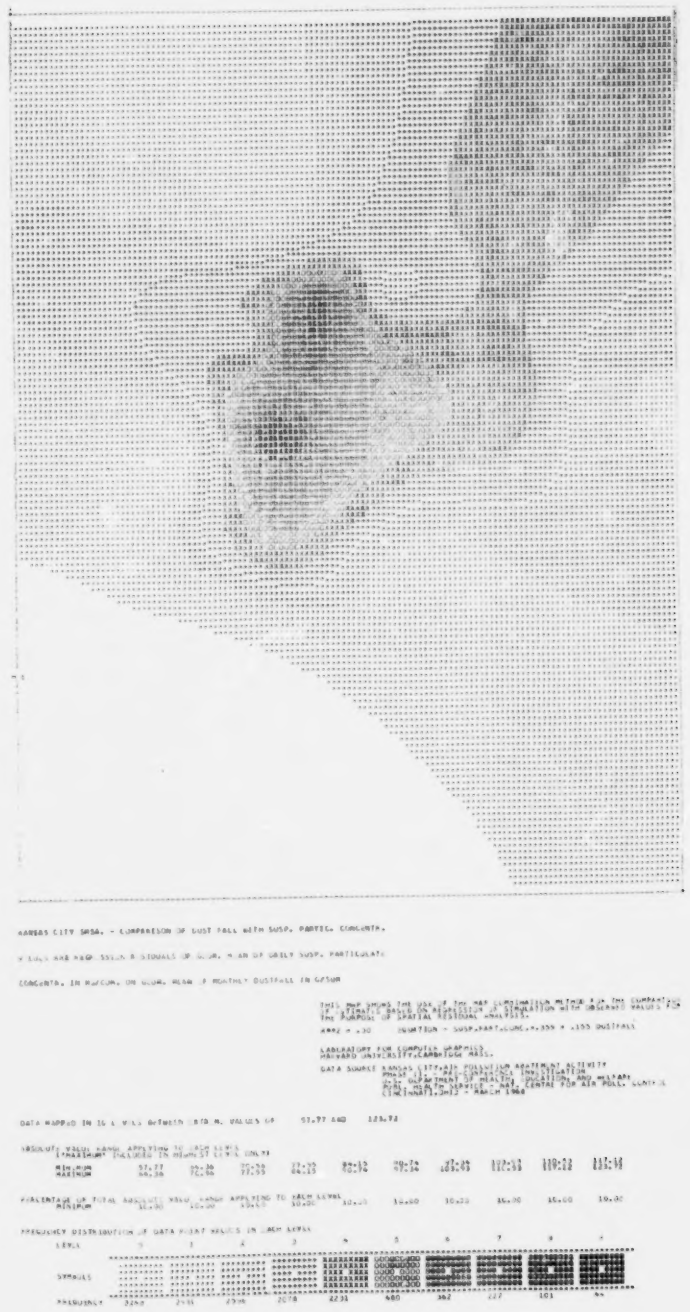


FIGURE D-10

KANSAS CITY REGION STUDY
Suspended Particulates — Daily Averages
Annual Geometric Mean
a. Measured at 16 Monitoring Stations
b. Regression Residuals on Geometric Mean
of Monthly Dustfall

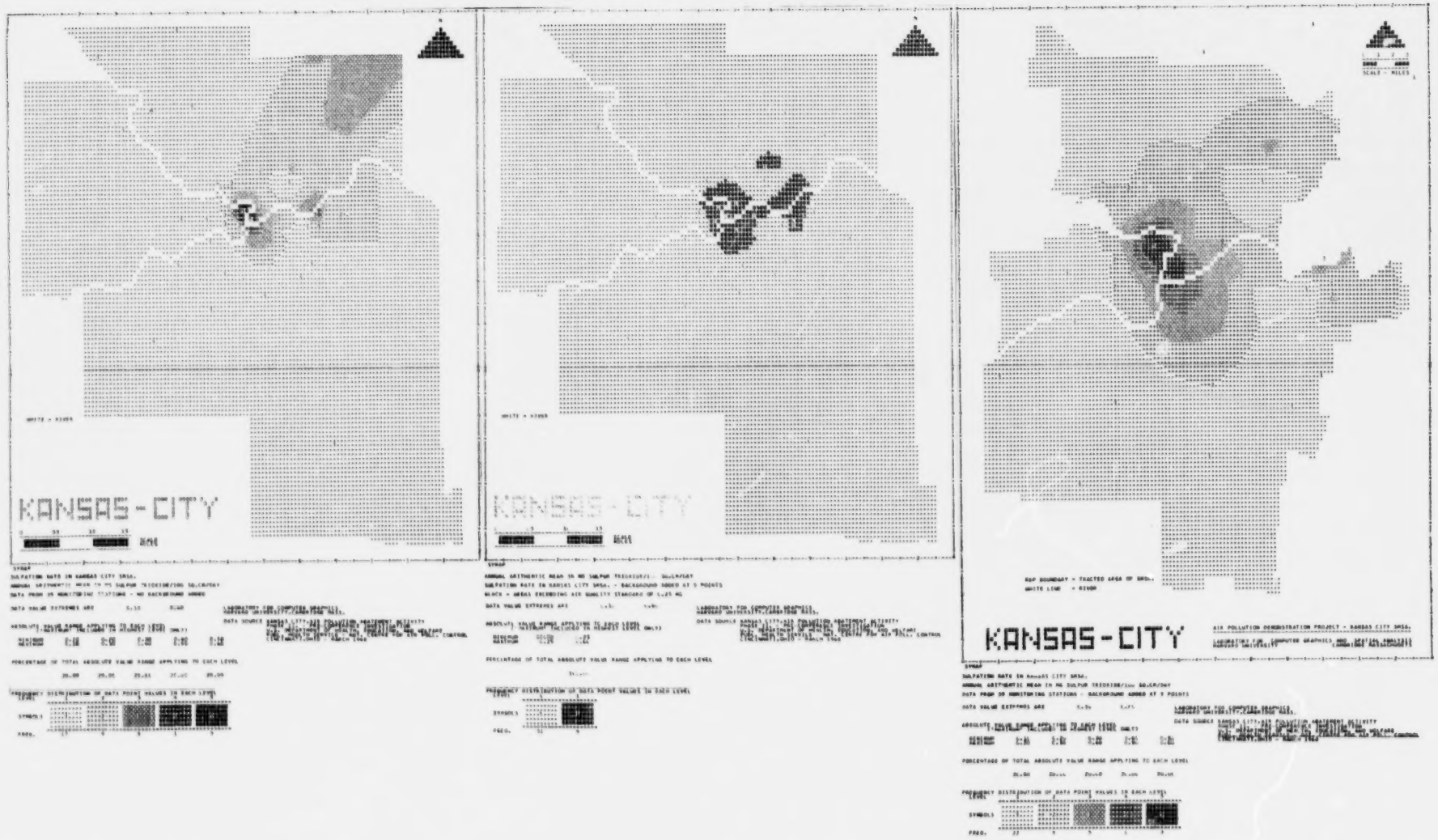
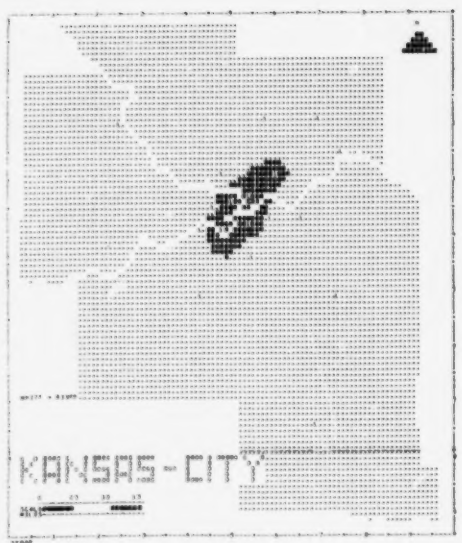


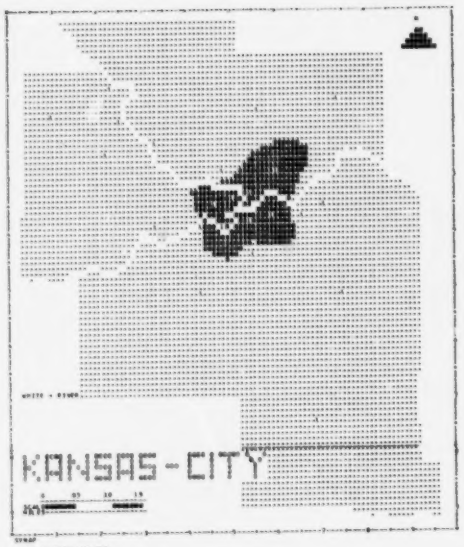
FIGURE D-11

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Sulfation Rate — Annual Arithmetic Mean
a. Data from 35 Monitoring Stations
b. Background Added at 5 Points-Areas Exceeding Standard
c Detail of b. for Tracted Area

FIGURE D-12

KANSAS CITY REGION STUDY
Tracted Area of SMSA
Sulfation Rate — Background Added at 5 Points
Areas Exceeding Health Standard
a. Annual Arithmetic Mean
b. Maximum Monthly Average
c. Combination of a. and b.





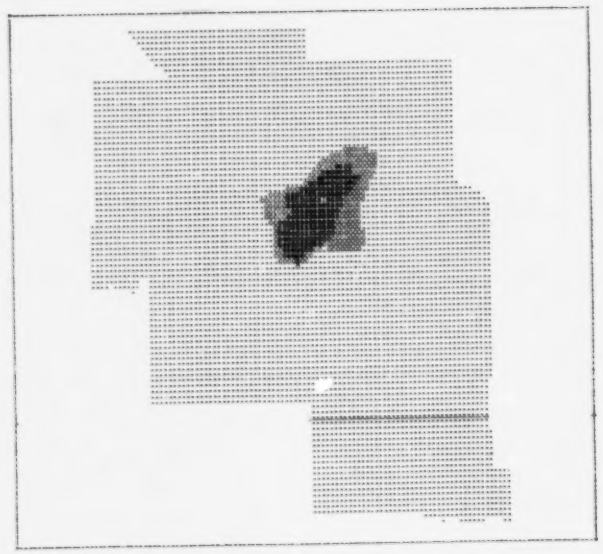


FIGURE D-13

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Suspended Particulate Concentration Exceeding Health Standard
a. Concentration of Highest Cumulative Frequency Percentile
b. Annual Geometric Mean of Daily Averages
c. Comparison of a. and b.

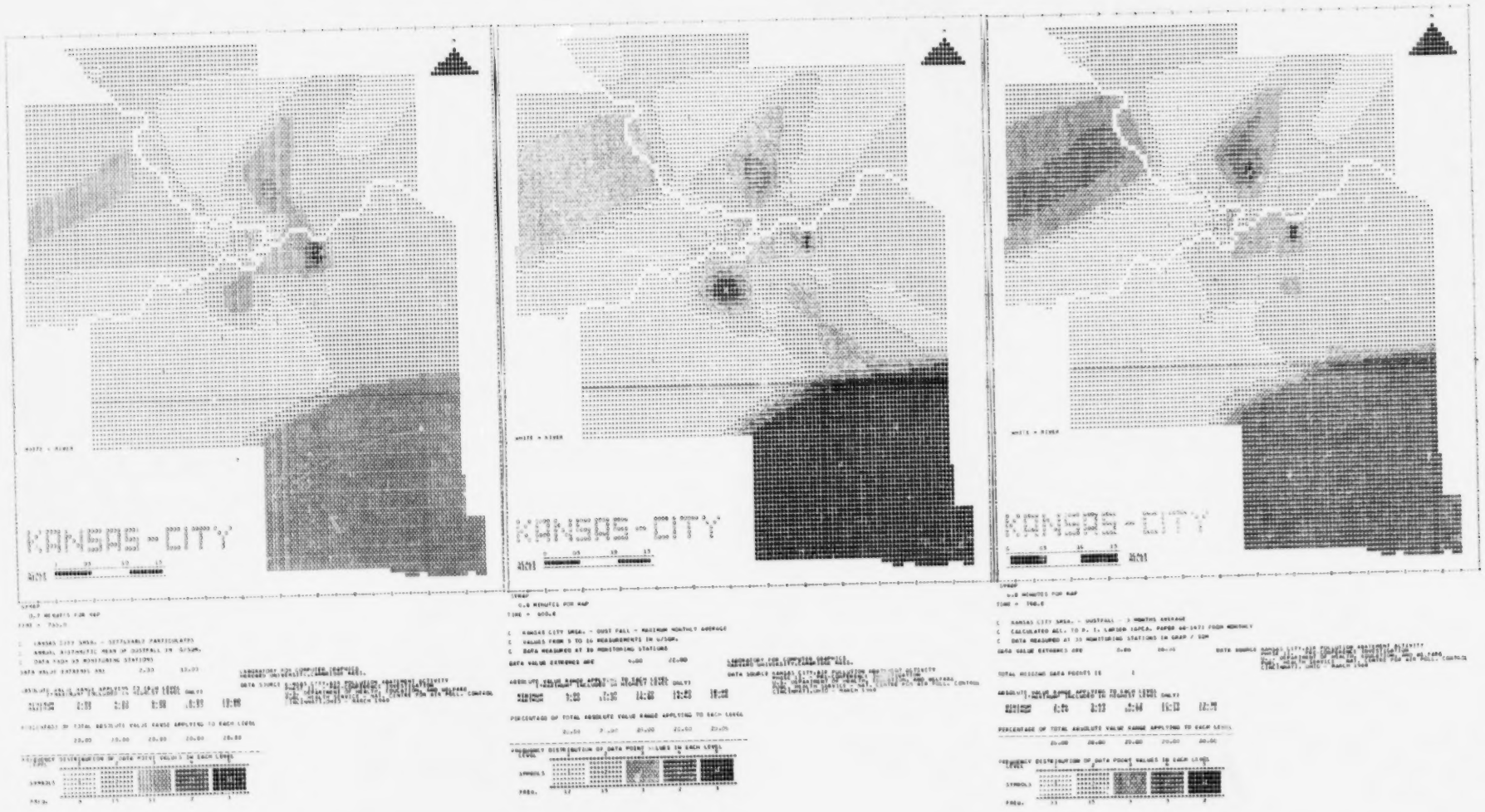


FIGURE D-14
KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Dustfall of Settleable Particulates
a. Annual Arithmetic Mean
b. Maximum Monthly Average
c. 3-month Average Calculated from Monthly Data

FIGURE D-15

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
SO_2 Concentration Calculated from Sulfation Rates
a. Yearly Average
b. 24-hour Average Occurring Once Every 3 Months
c. 1-hour Average Occurring Once Every 4 Days

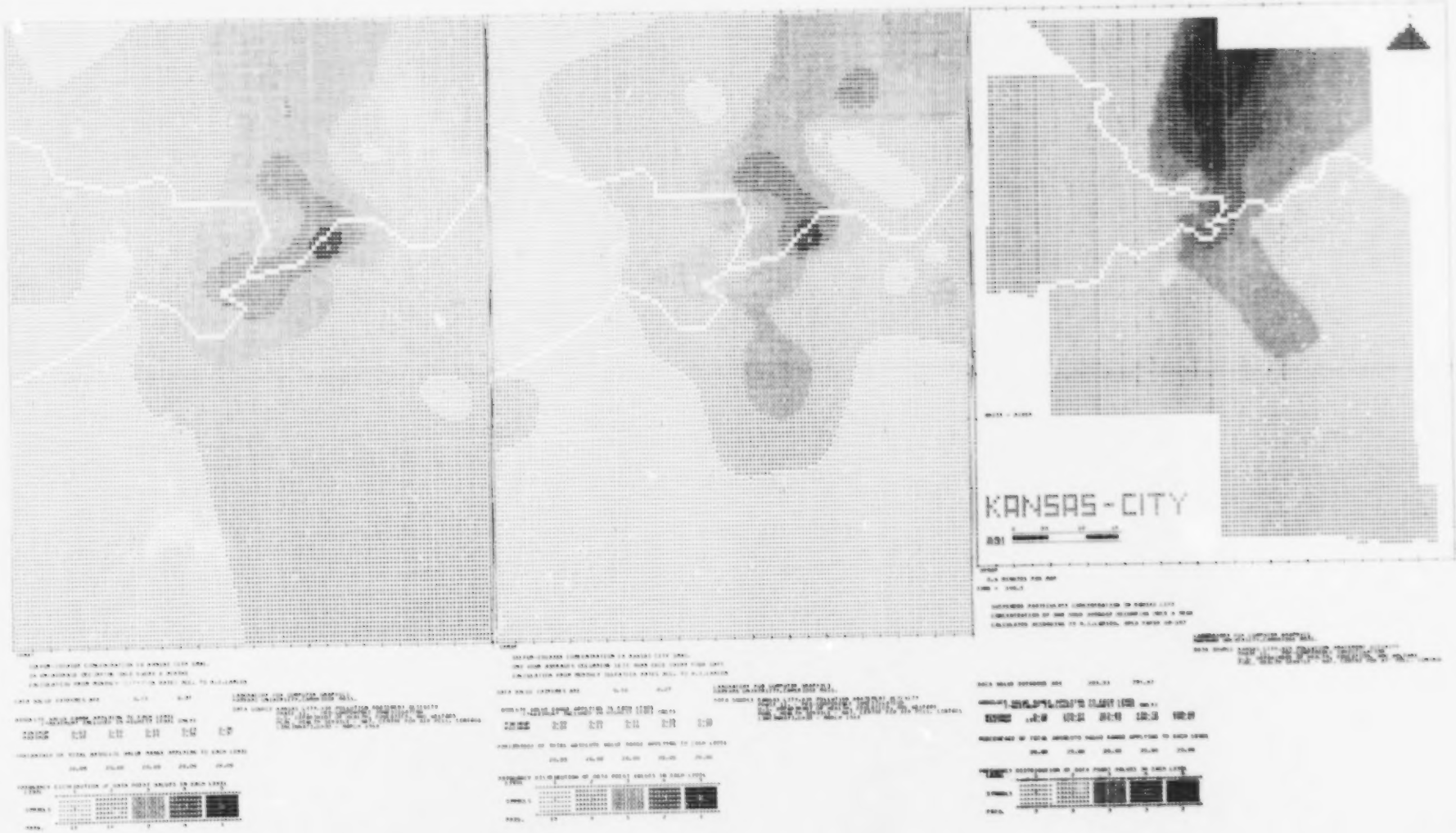


FIGURE D-16

KANSAS CITY REGION STUDY
Averaging Times According to Larsen
a. SO_2 Concentration Calculated from Monthly Sulfation Rates
24-hour Average Occurring Once Every 3 Months
b. SO_2 Concentration Calculated from Monthly Sulfation Rates
1-hour Average Occurring Once Every 4 Days
c. Suspended Particulate Concentration
1-hour Average Occurring Once a Year

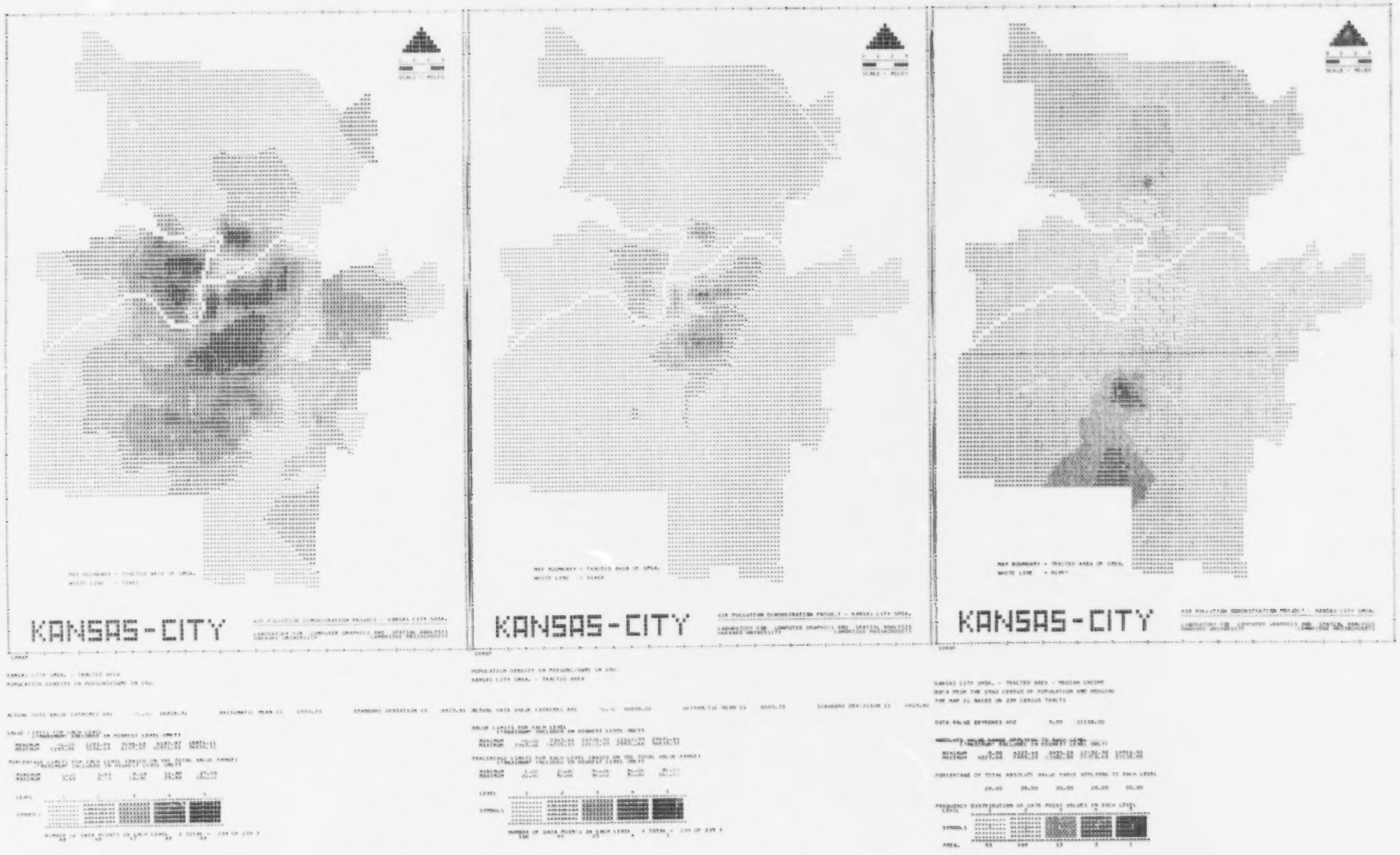


FIGURE D-17

KANSAS CITY REGION STUDY
Tracted Area of SMSA
Demographic Data
a. Population Density — Equal Data Points per Level.
b. Population Density — Equal Interval Value Range
c. Median Income

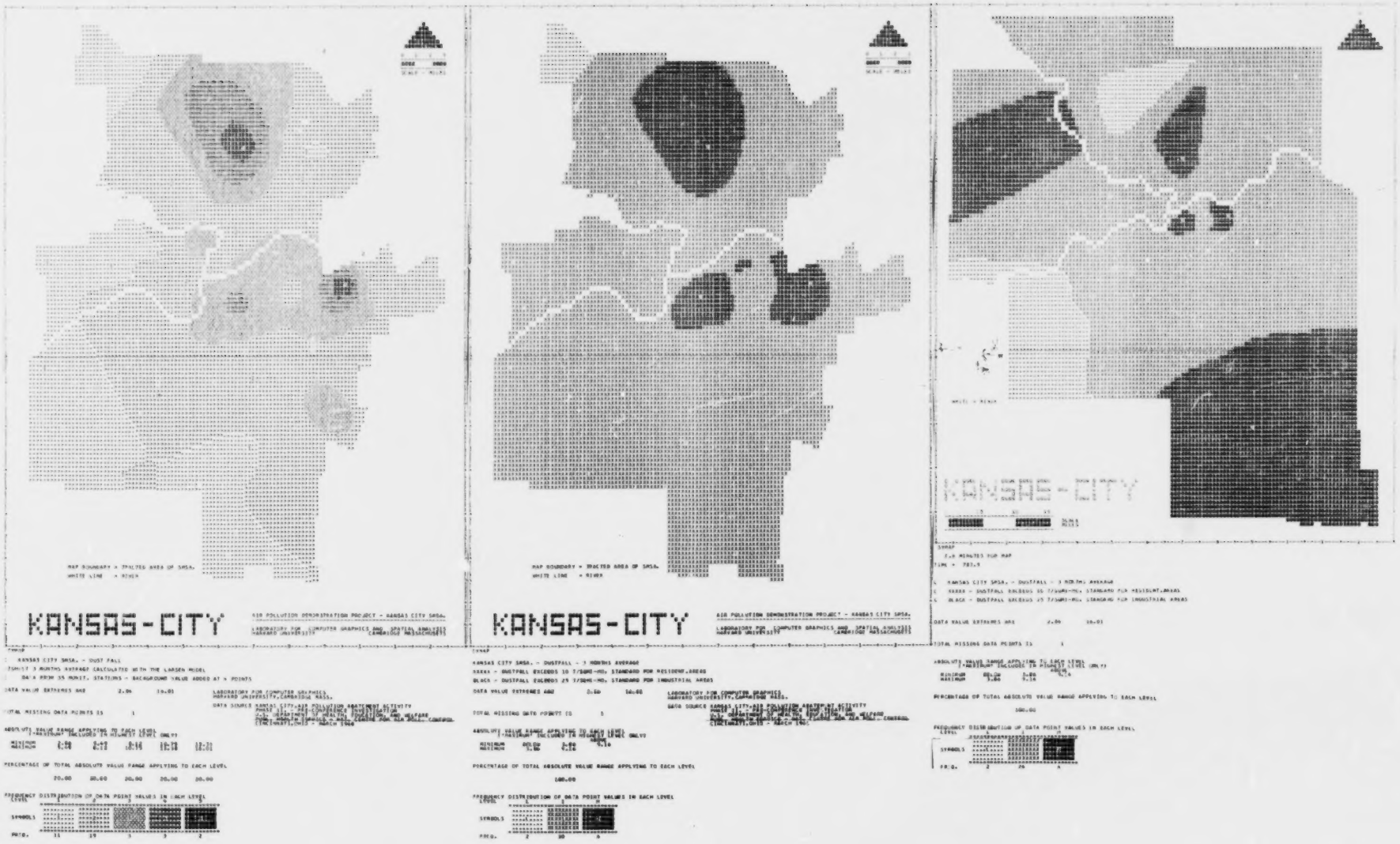


FIGURE D-18

KANSAS CITY REGION STUDY
Tracted Area of SMSA
Dustfall Concentration
Highest 3-month Average Calculated with the Larsen Model
a. Background Values Added at 4 Points
b. Residential and Industrial Areas Exceeding Standards
c. Same as b. Extended over Entire SMSA

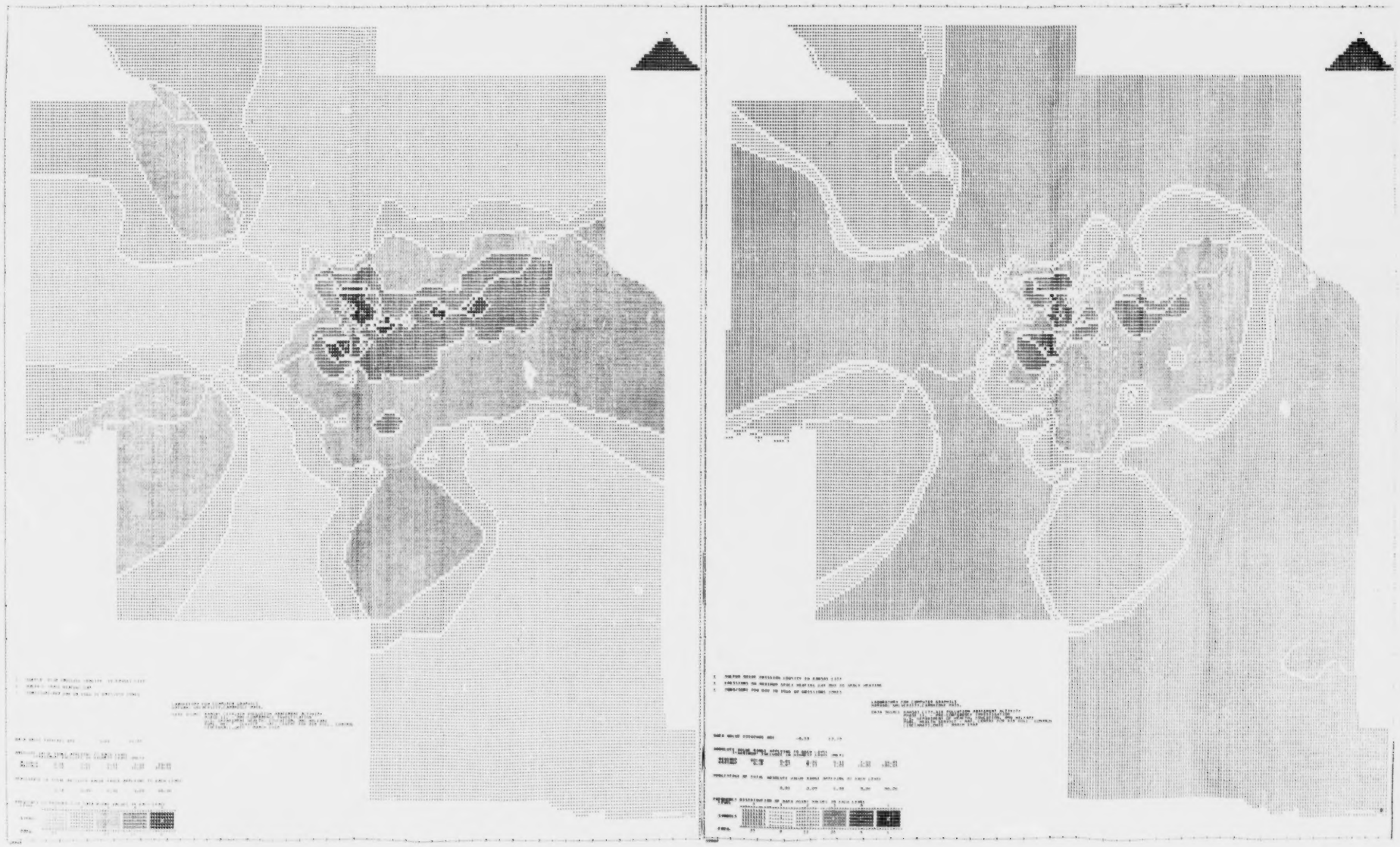


FIGURE D-19

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Air Pollutant Emission Density — Sulfur Oxides
a. Average Space Heating Day
b. Maximum Space Heating Day

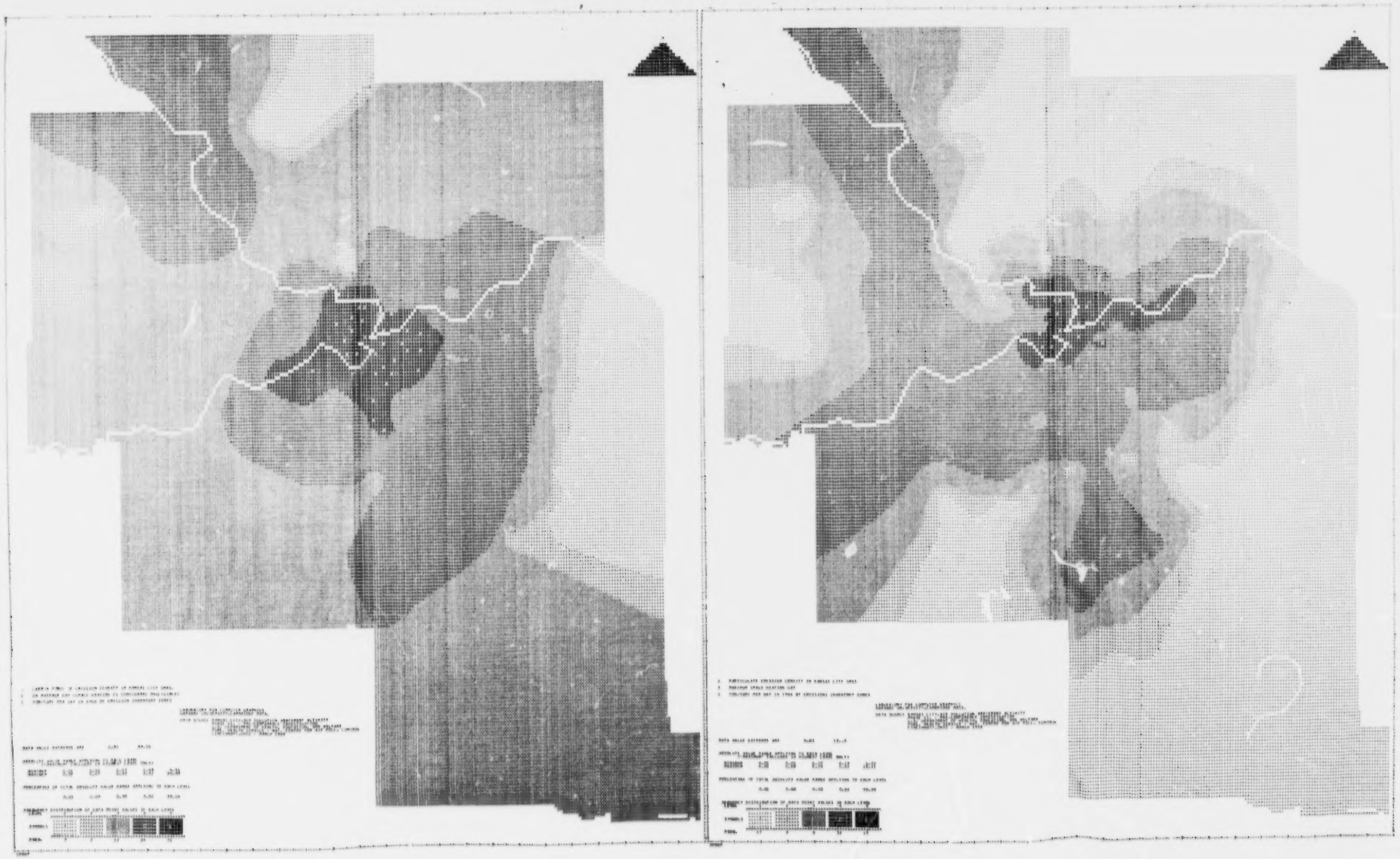
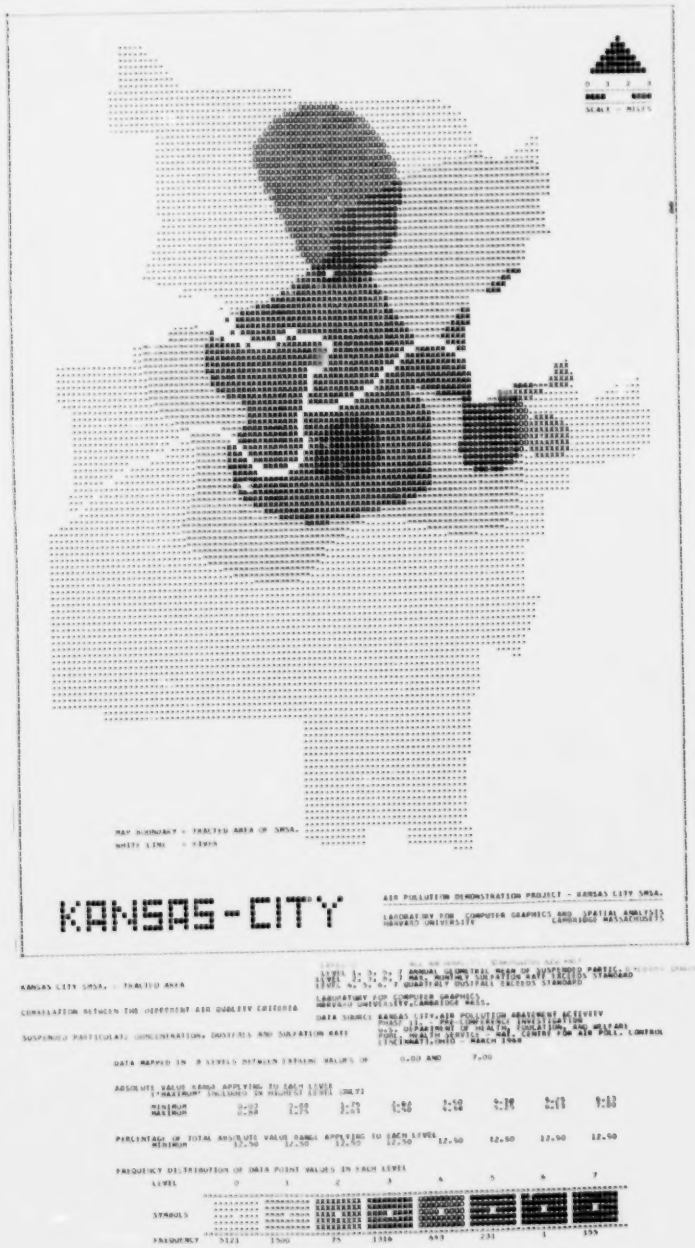


FIGURE D-20

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Air Pollutant Emission Density
a. Carbon Monoxide — Average Day
b. Particulates — Maximum Space Heating Day

FIGURE D-21

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Particulate Emission Density
a. Average Space Heating Day
b. Maximum Space Heating Day
c. Day without Space Heating



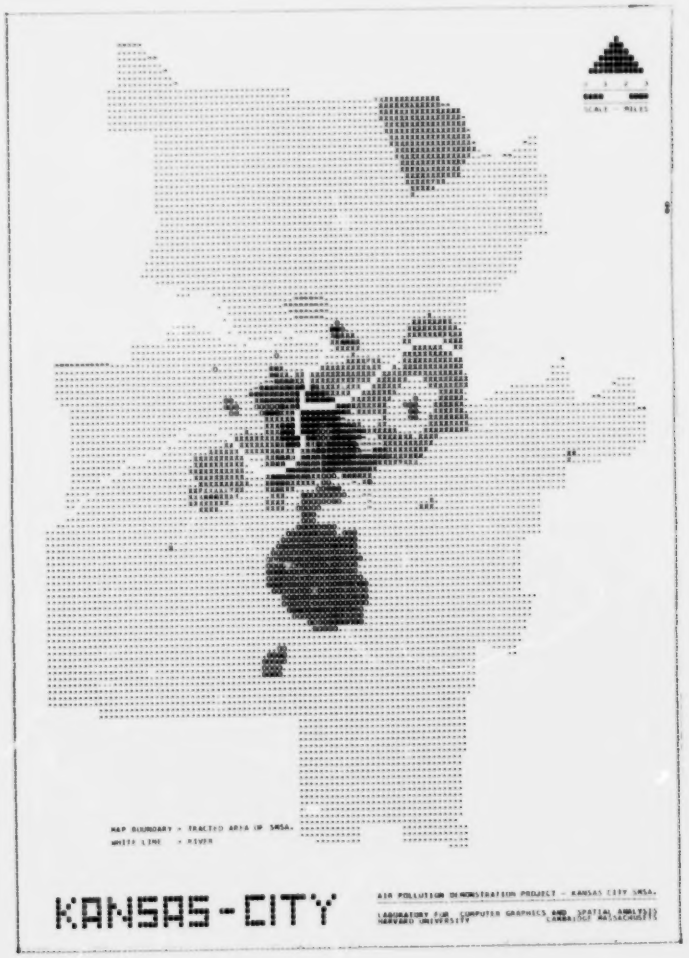
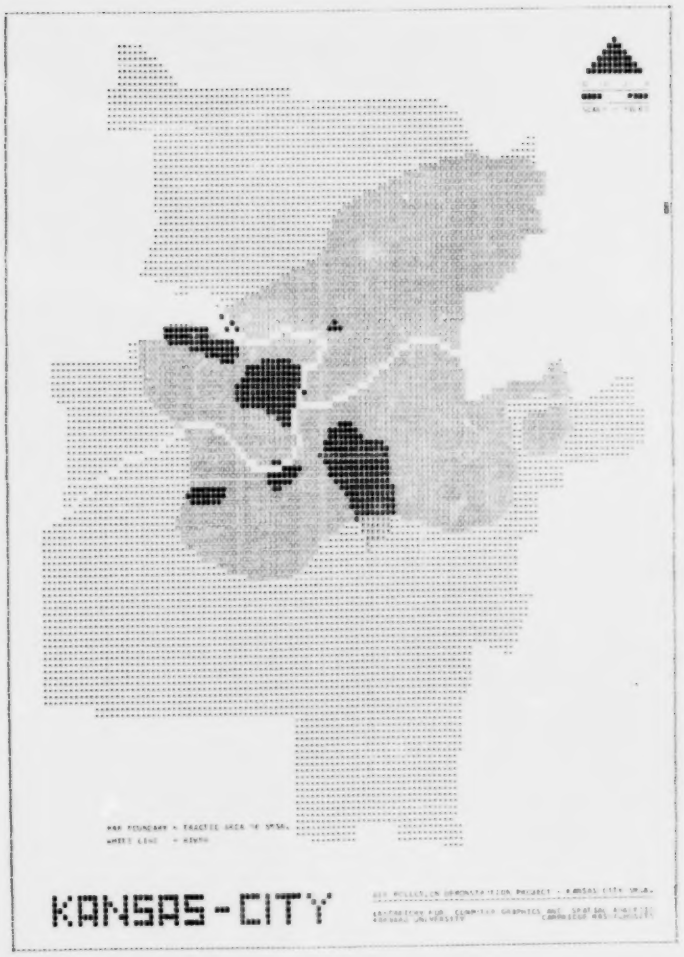


FIGURE D-22

KANSAS CITY REGION STUDY
Tracted Area of SMSA
a. Correlation between Different Air Quality Standards
b. Correlation between Different Social Problem Areas



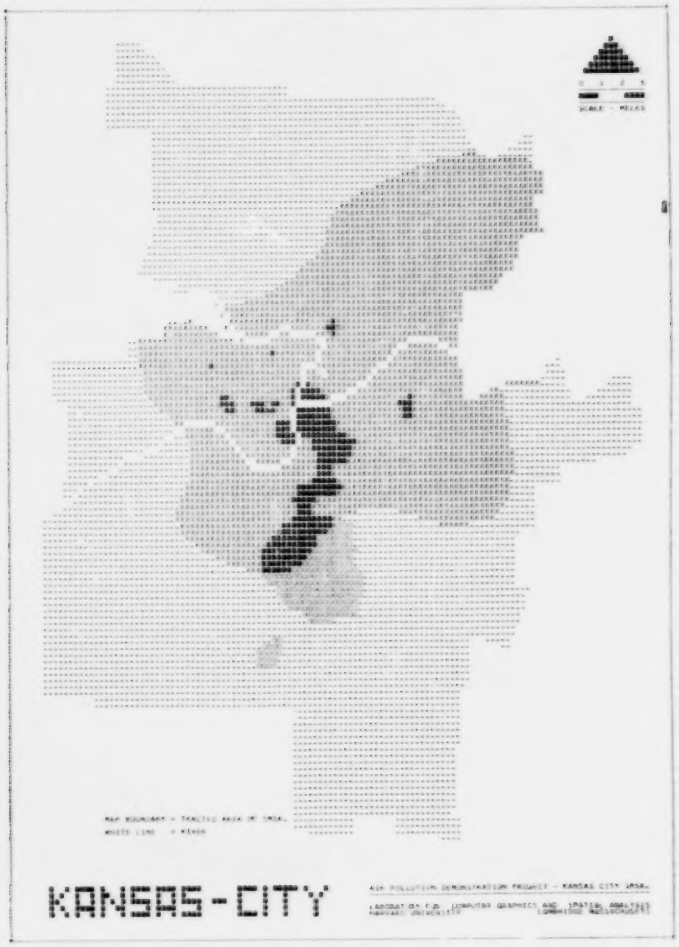


FIGURE D-23

KANSAS CITY REGION STUDY
Tracted Area of SMSA
Correlation of Air Quality and Demographic Data

a. Levels 1 & 3 — more than 25% of Population Negroes
   Levels 2 & 3 — Any of Air Quality Standards Exceeded
b. Levels 1 & 3 — Annual Geometric Mean Exceeds 75 mg/m^3
   Levels 2 & 3 — Median Age of Population above 35 yrs

FIGURE D-24

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Suspended Particulates — Annual Geometric Mean of Daily Averages
Maximum Search Radius for Interpolation:
a. 1.0 inches b. 1.5 inches c. 2.0 inches

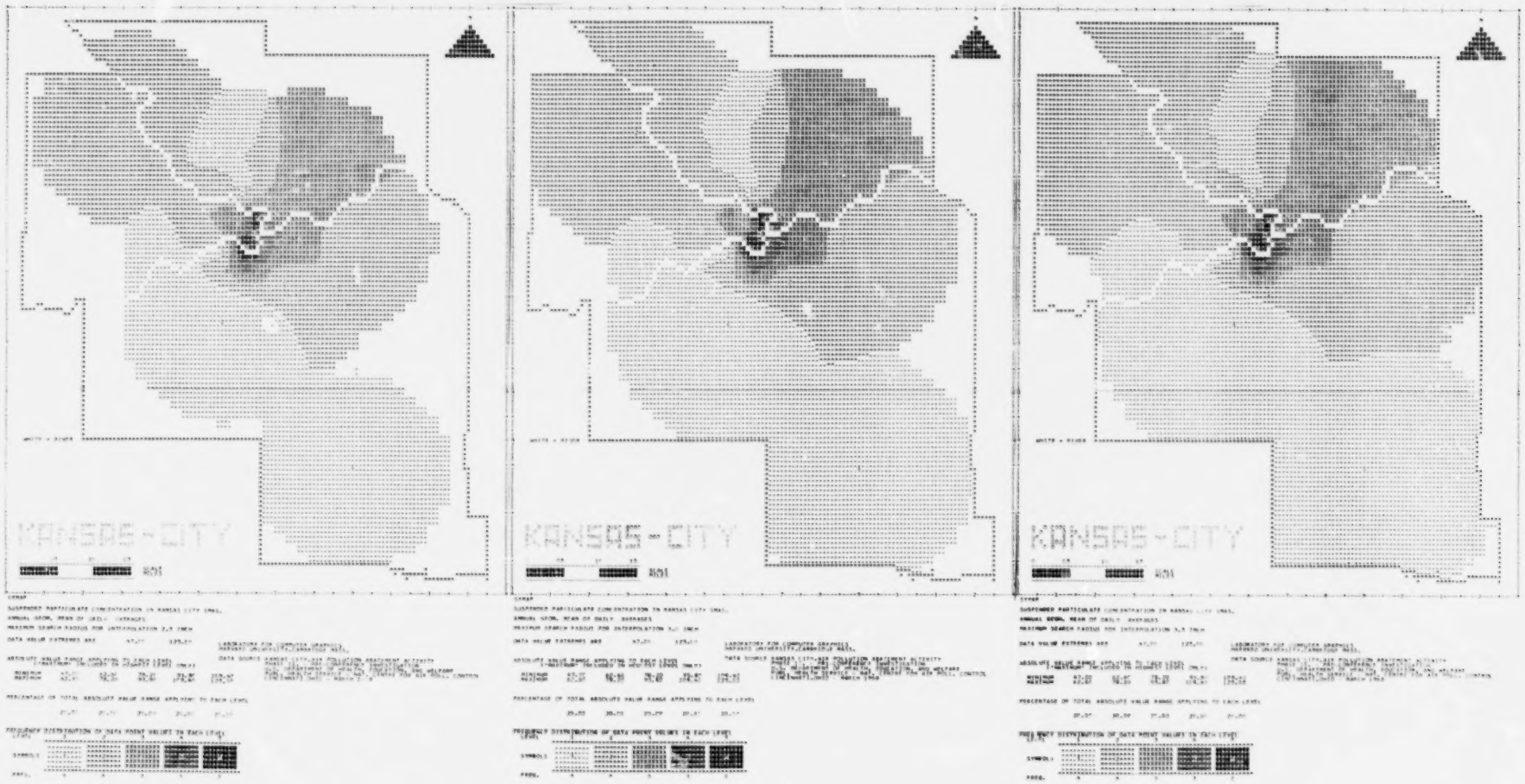


FIGURE D-25

KANSAS CITY REGION STUDY
Standard Metropolitan Statistical Area
Suspended Particulates — Annual Geometric Mean of Daily Averages
Maximum Search Radius for Interpolation:
a. 2.5 inches b. 3.0 inches c. 3.5 inches

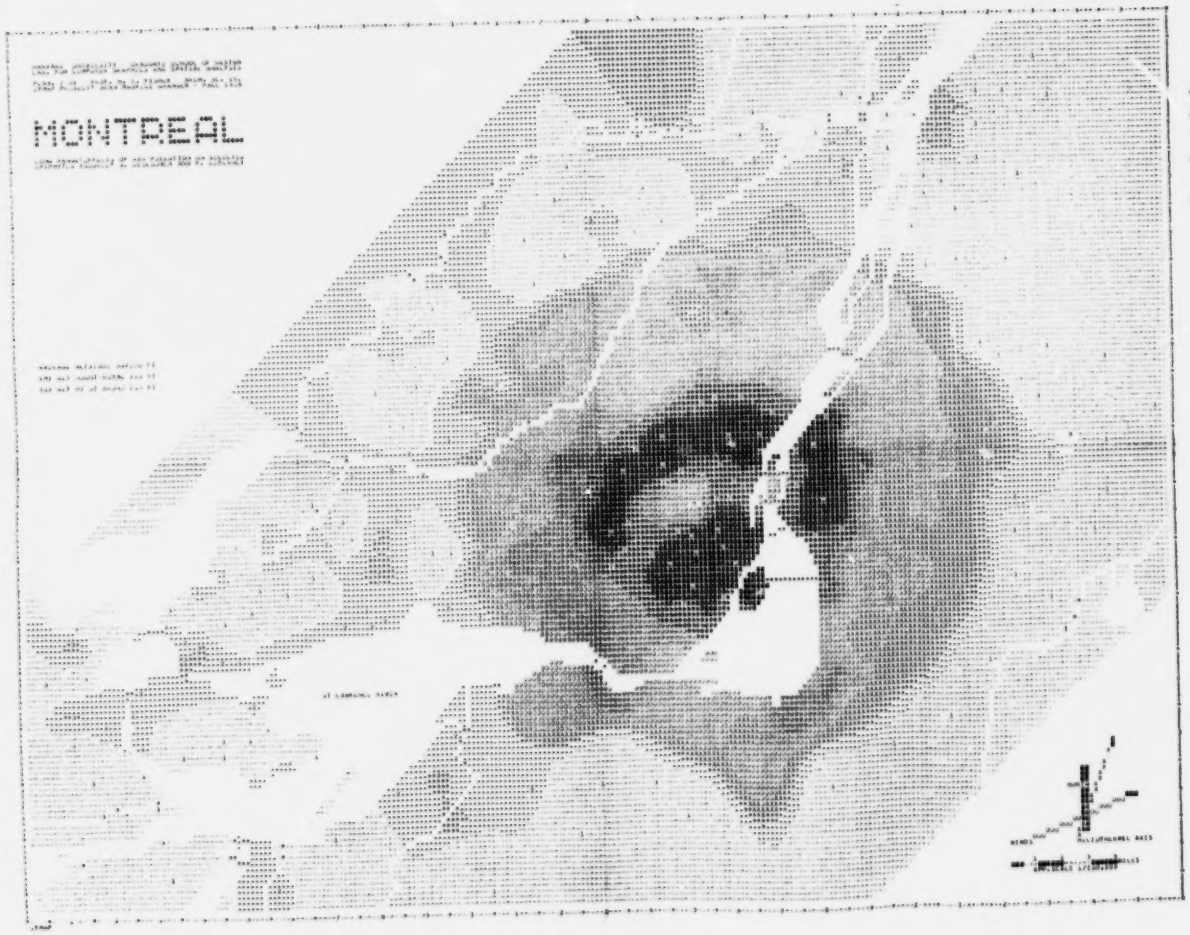


FIGURE E-1

MONTREAL REGION STUDY
Distribution of Land Use

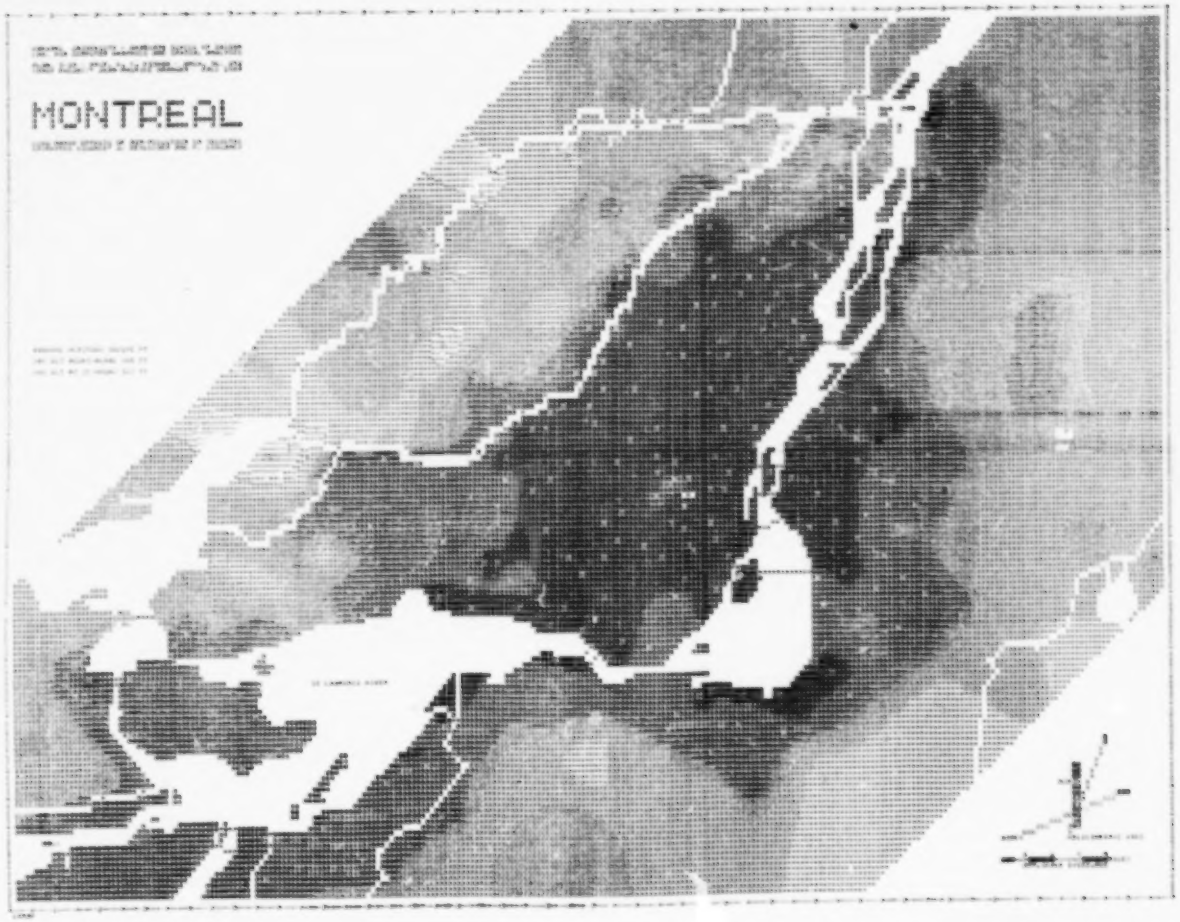


FIGURE E-2

MONTREAL REGION STUDY
Index of Atmospheric Purity
Equal Value Range

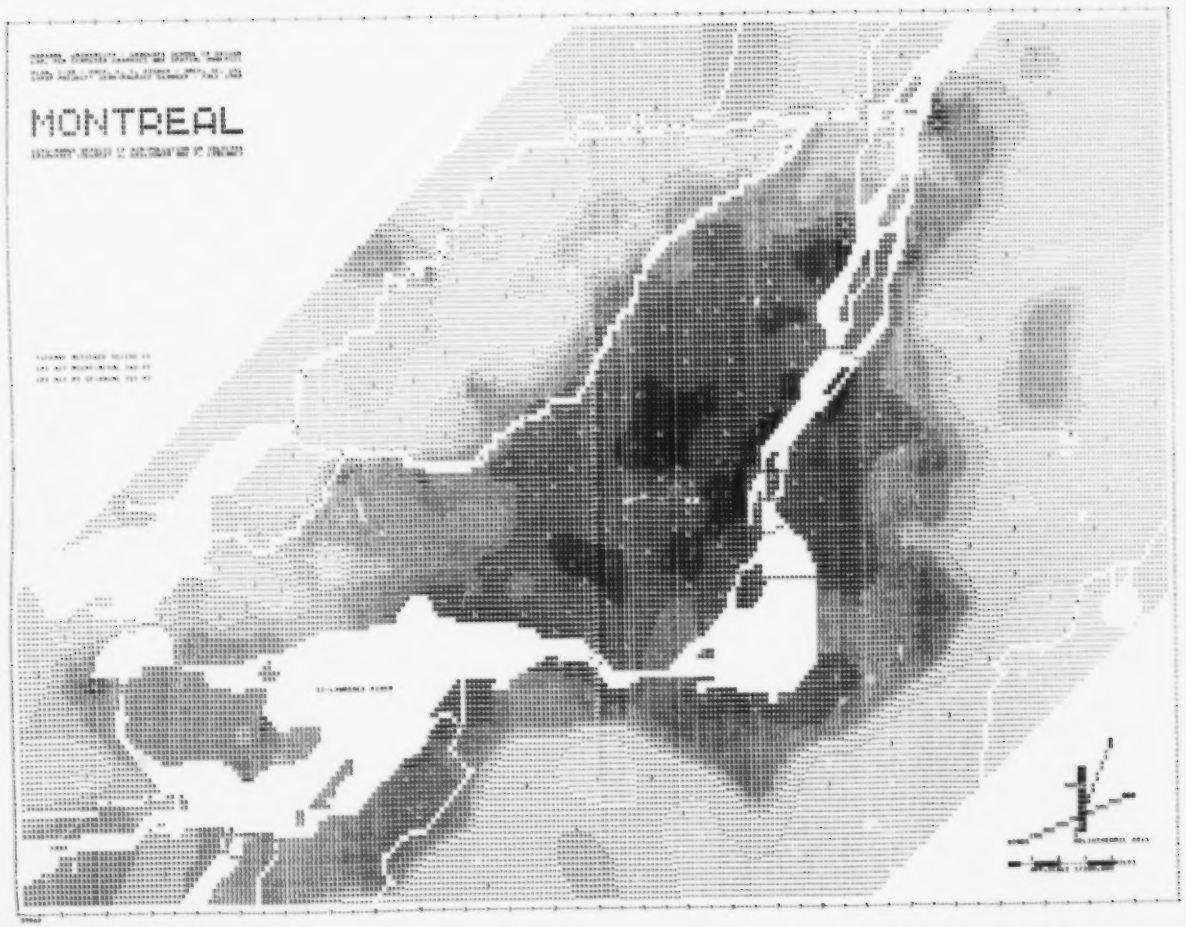


FIGURE E-3

MONTREAL REGION STUDY
Index of Atmospheric Purity
Equal Distribution of Data Points to Contour Levels

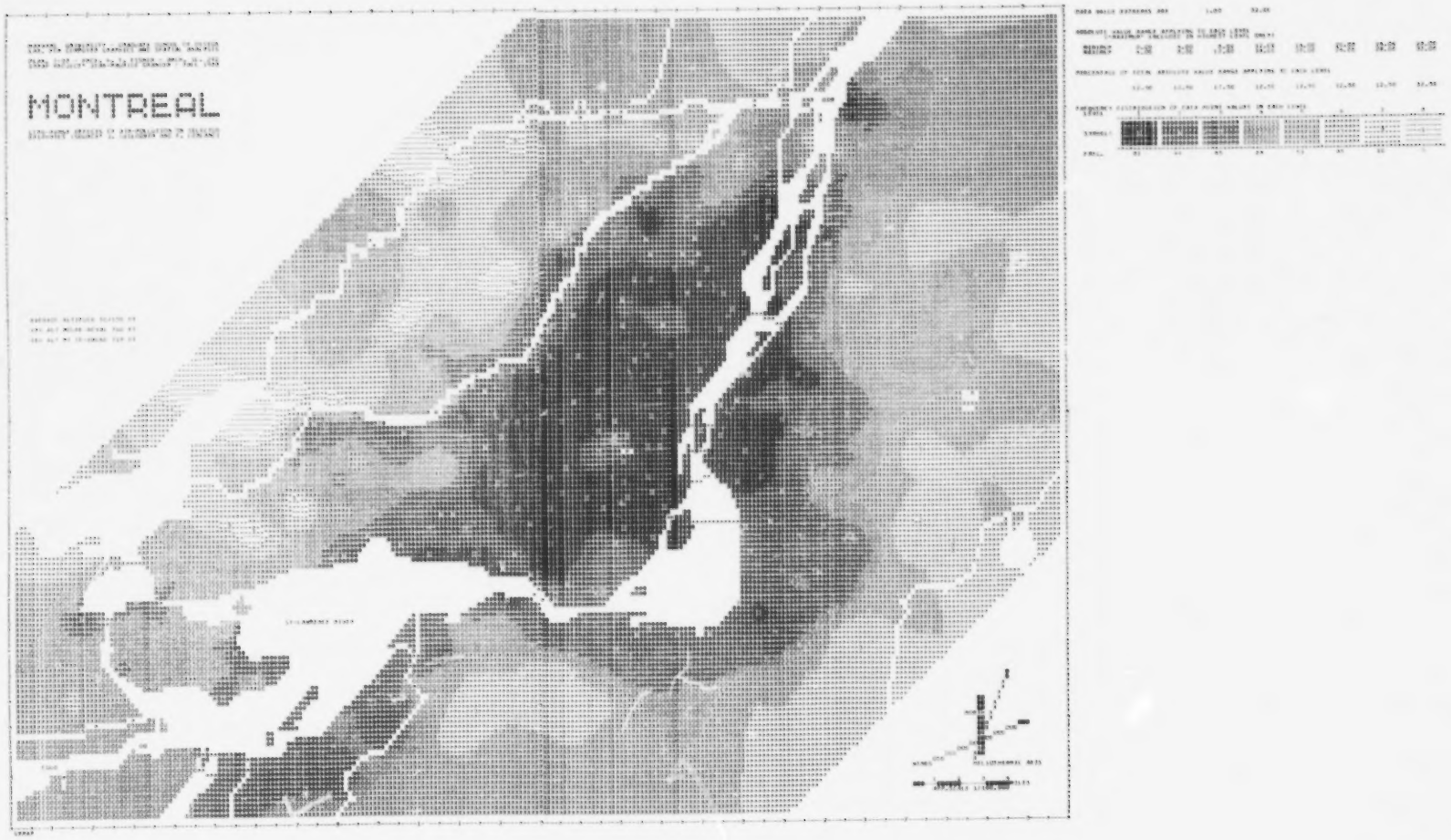


FIGURE E-4

MONTREAL REGION STUDY
Number of Epiphytes as an Air Pollution Index
Equal Value Range

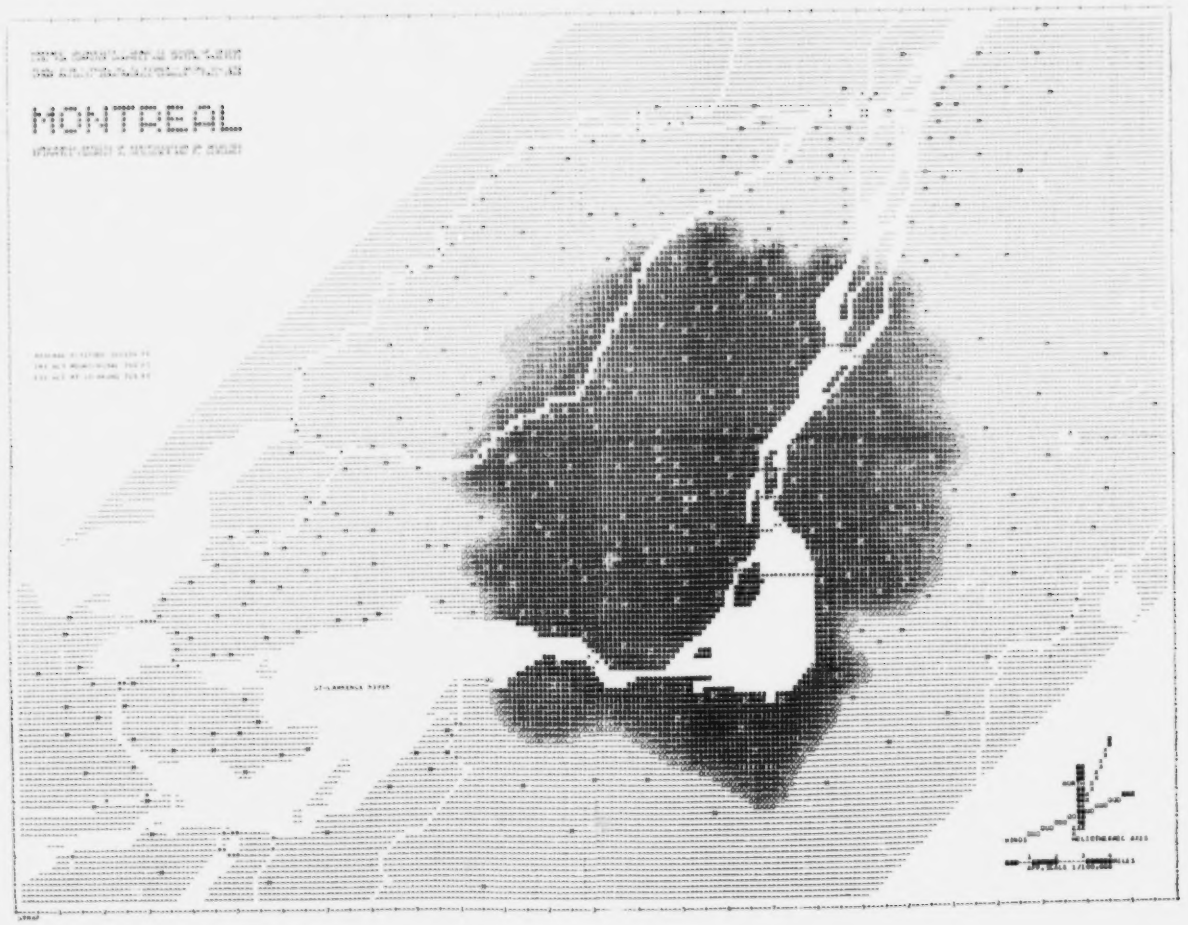


FIGURE E-5

MONTREAL REGION STUDY
Distribution of I.A.P. over the Urbanized Area
Equal Value Range

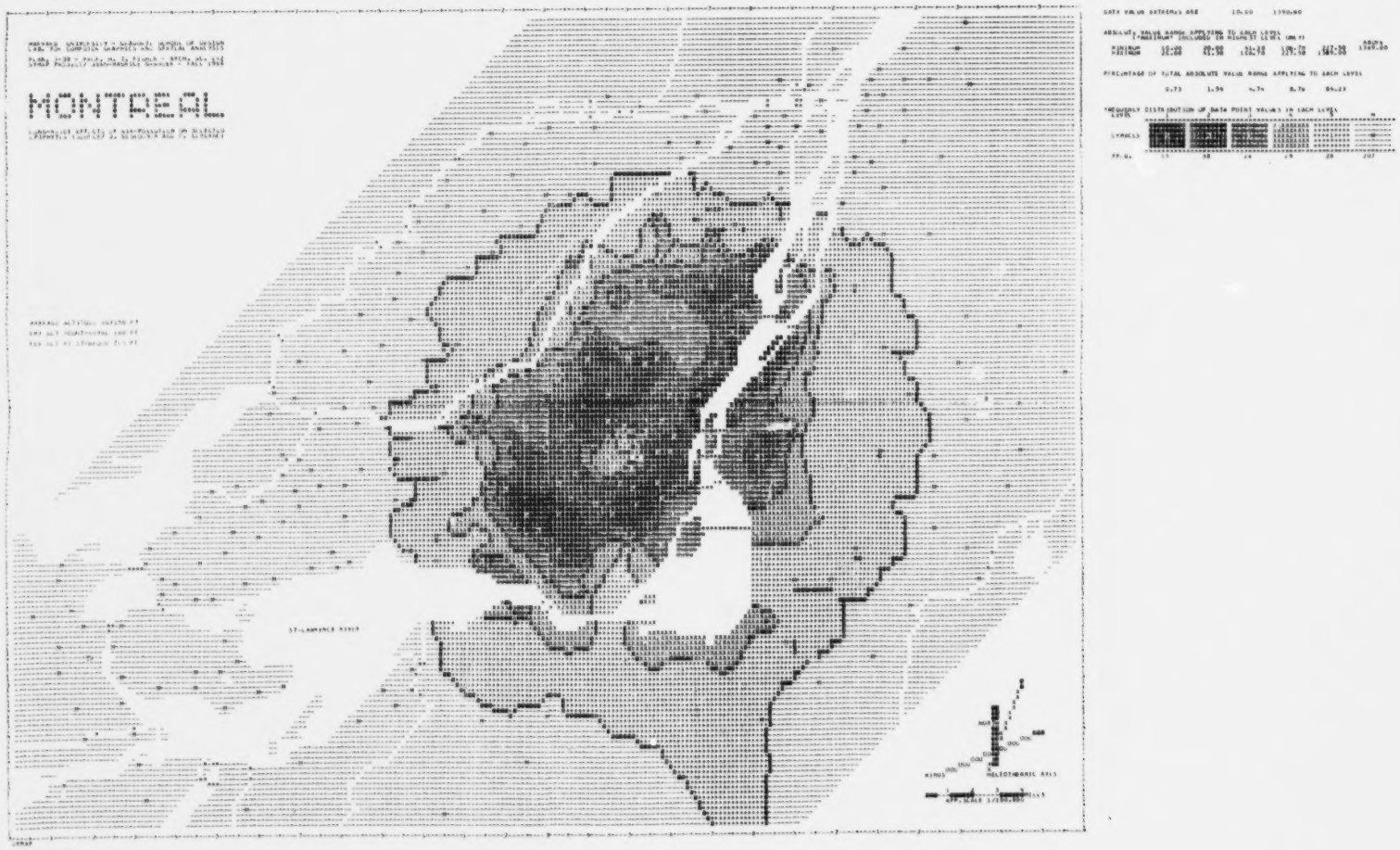


FIGURE E-6

MONTREAL REGION STUDY
Distribution of I. A. P. over the Urbanized Area
Equal Distribution of Data Points to Contour Lines

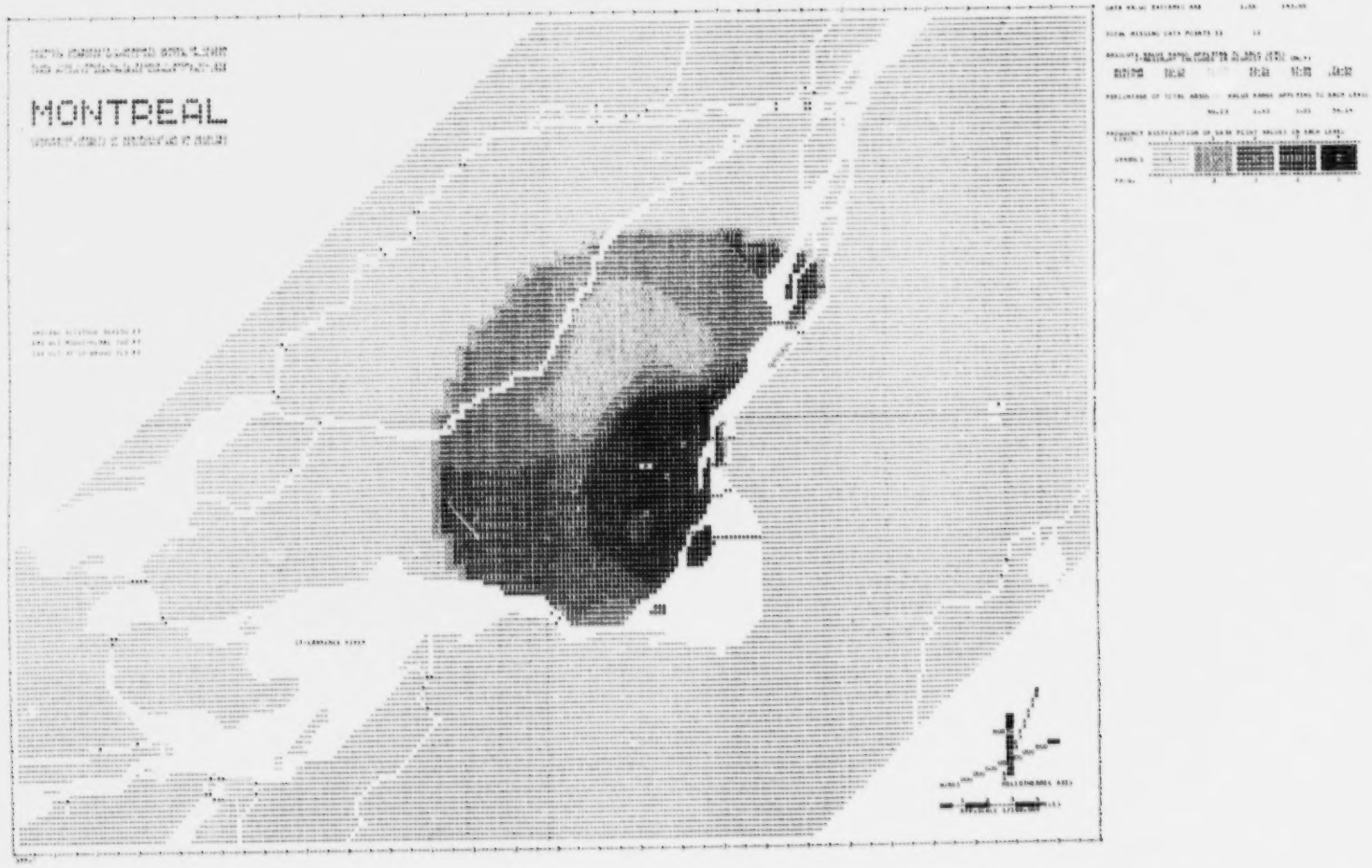


FIGURE E-7

MONTREAL REGION STUDY
Coefficient of Haze
City of Montreal Air Pollution Network

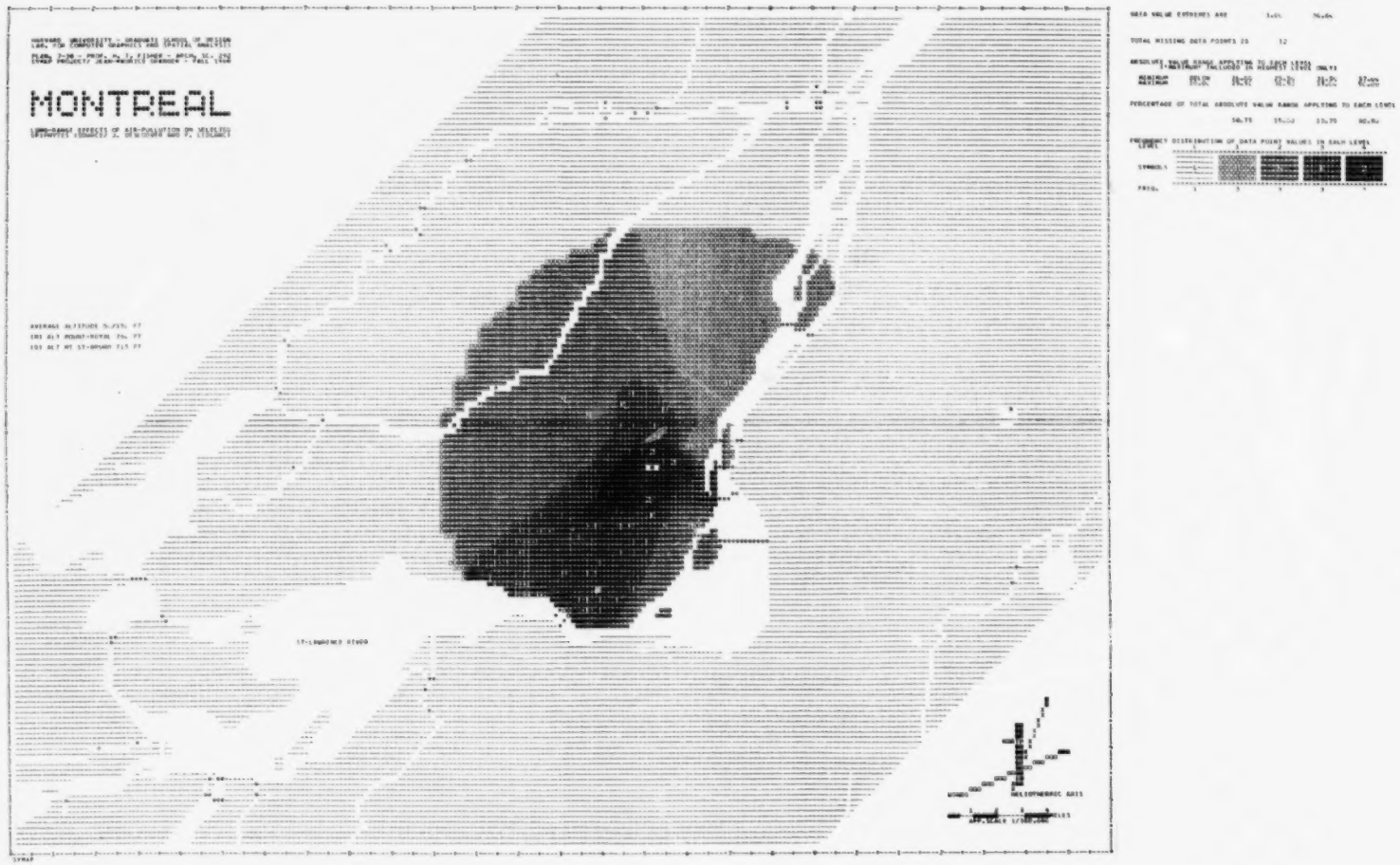


FIGURE E-8

MONTREAL REGION STUDY
Sulfur Dioxide
City of Montreal Air Pollution Network

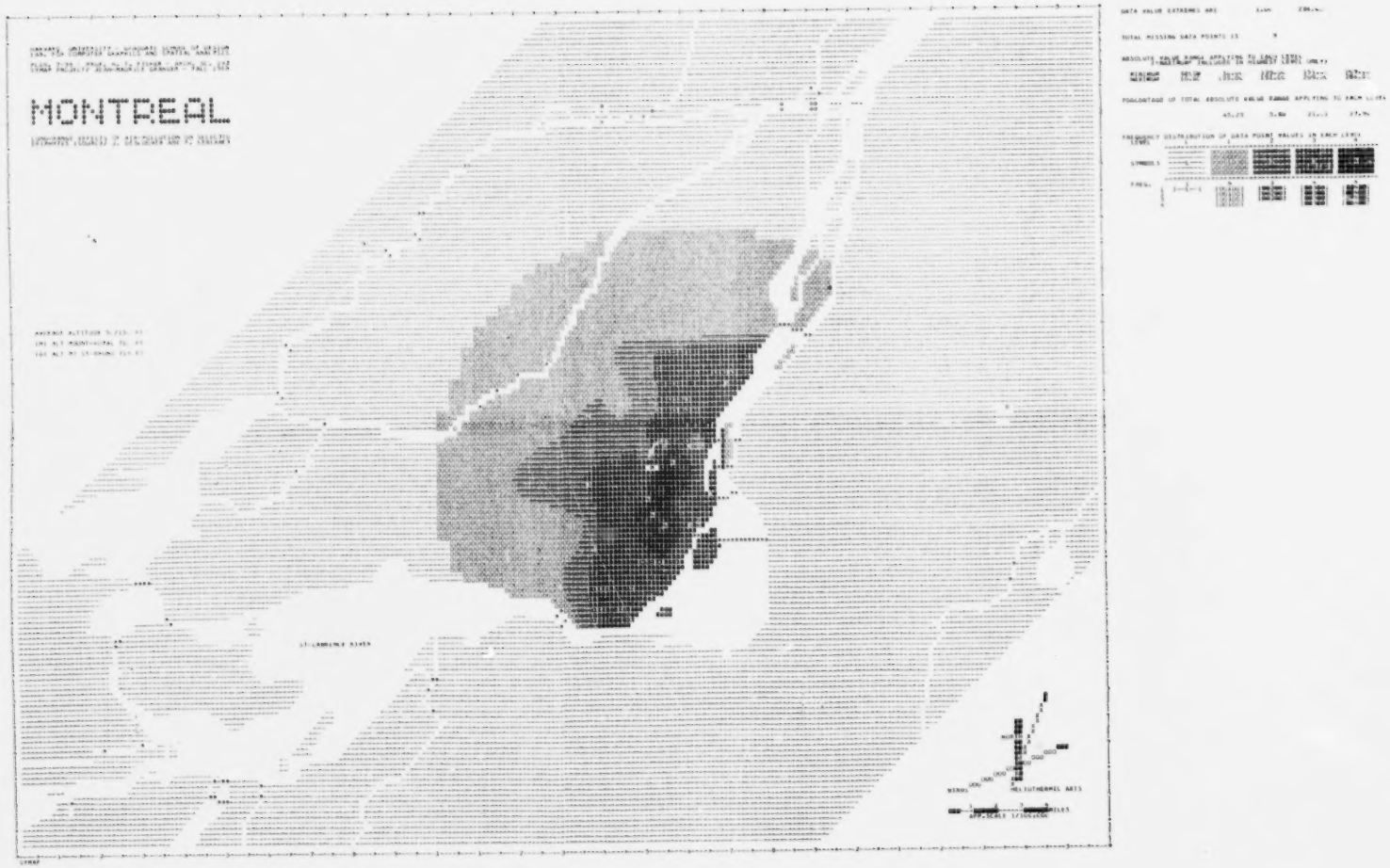


FIGURE E-9

MONTREAL REGION STUDY
Insoluble Residue
City of Montreal Air Pollution Network

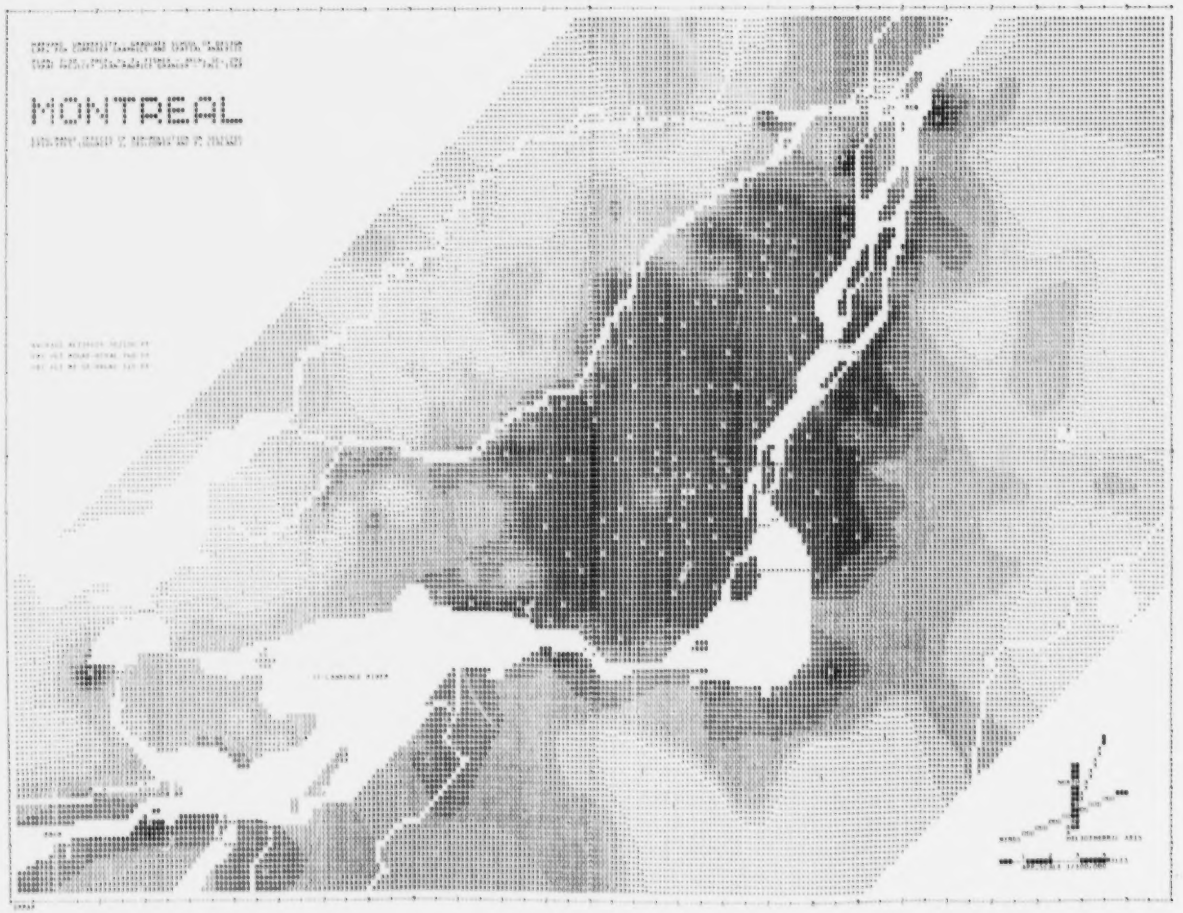


FIGURE E-10

MONTREAL REGION STUDY
"Best Selection" Procedure
Distribution of Physcia Millegrana by Coverage & Fertility

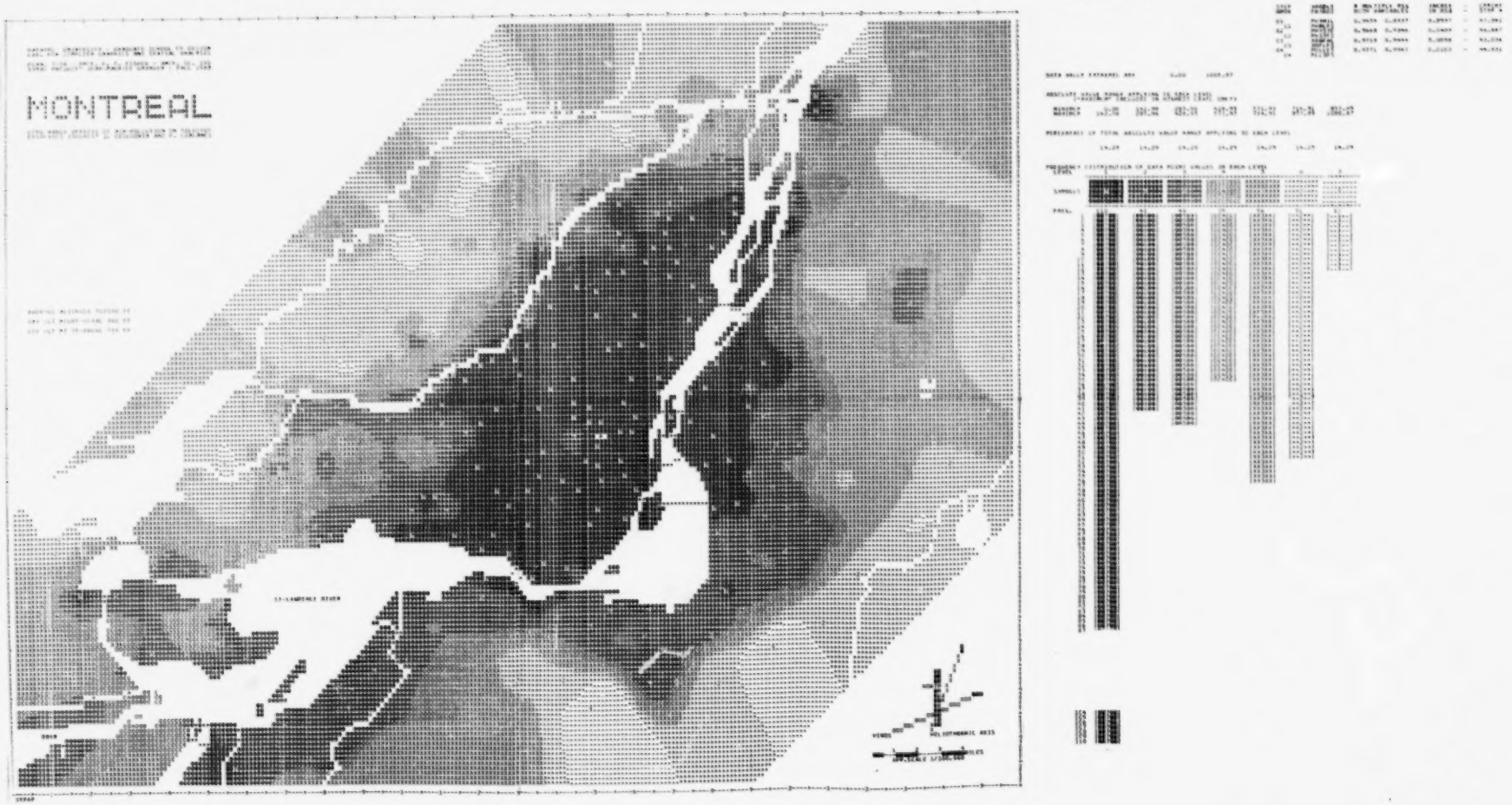


FIGURE E-11

MONTREAL REGION STUDY
"Best Selection" Procedure
Distribution of Physcia Millegrana, Physcia Stellaris,
Xanthoria Fallax, & Leskea Polycarpa by Coverage and Fertility

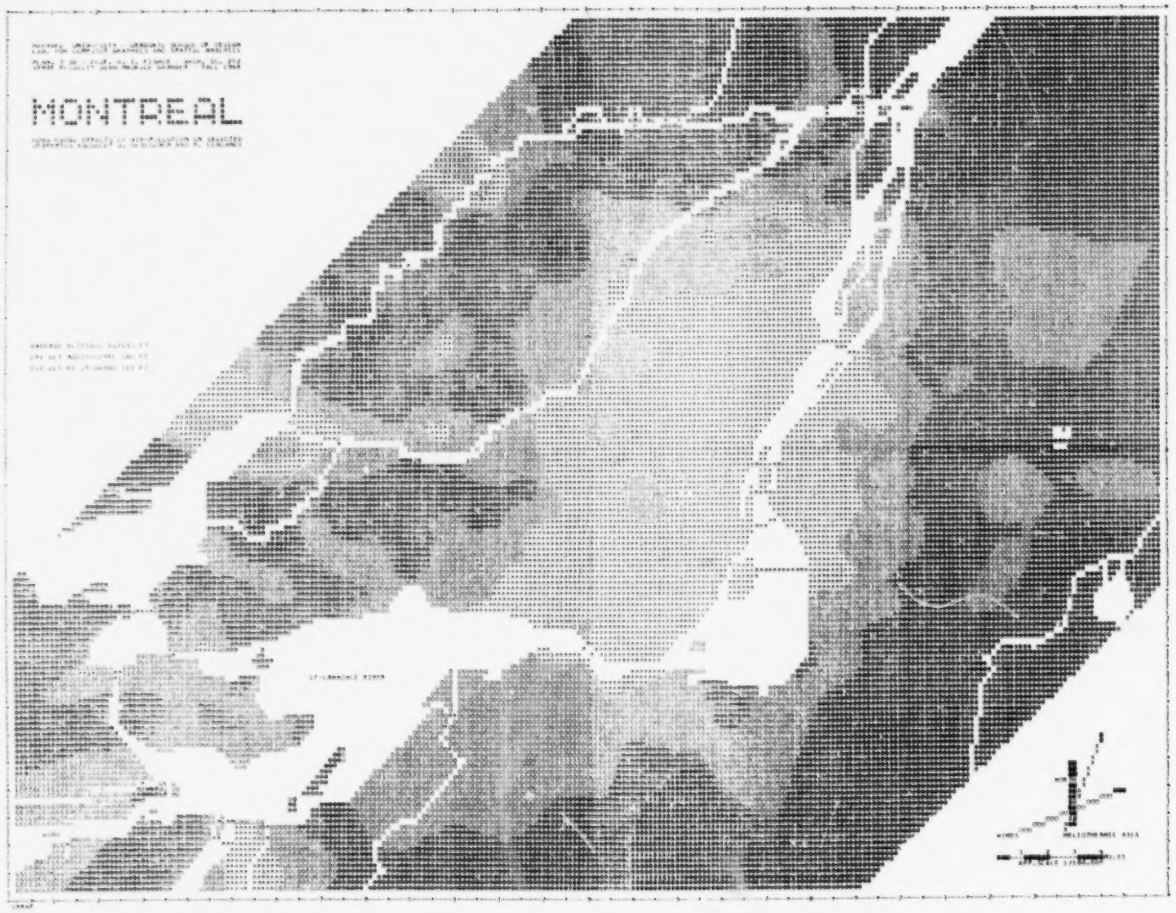


FIGURE E-12

MONTREAL REGION STUDY
Difference between Figures E-11 and E-2
Discrepancies in "Best Selection"

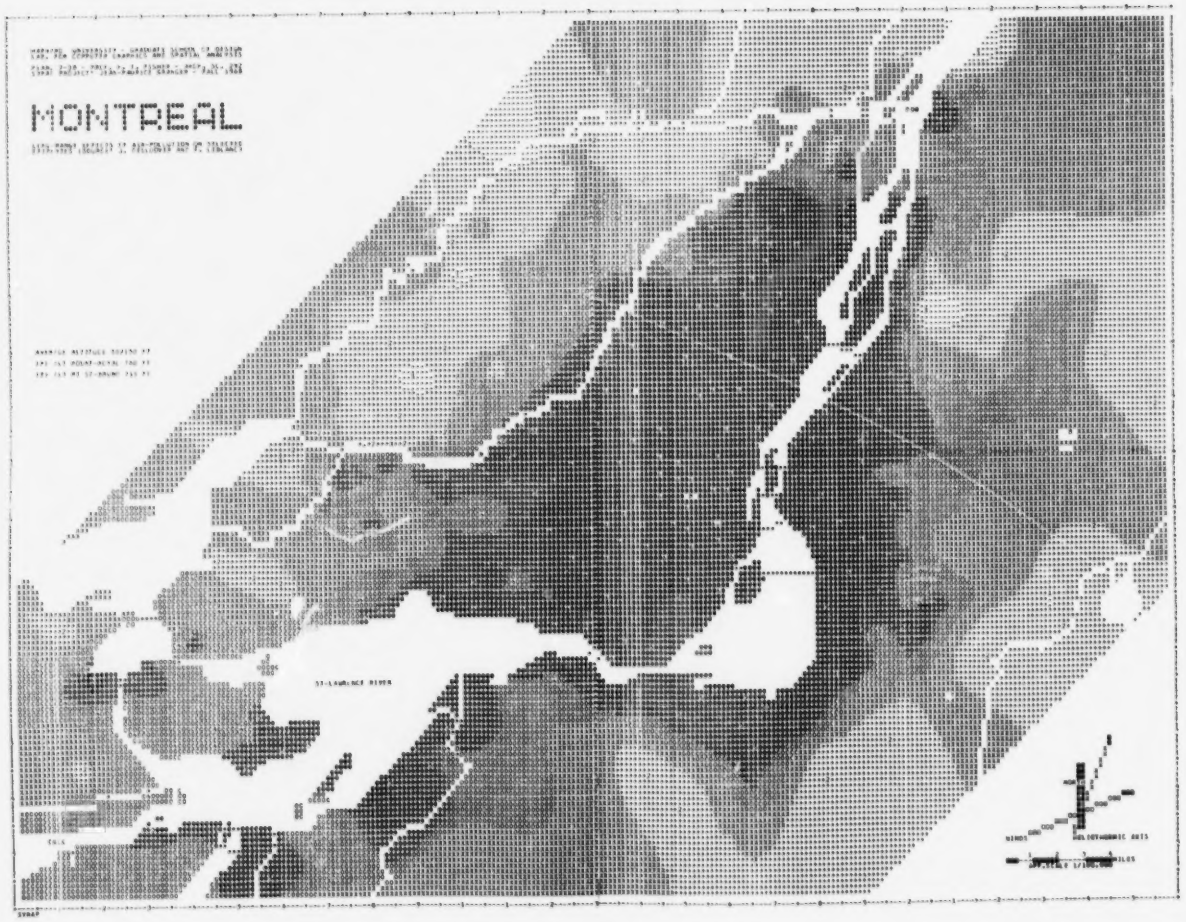


FIGURE E-13

MONTREAL REGION STUDY
"Alternate Selection" Procedure
Distribution of Physcia Millegrana, Physcia Adcendens,
Parmelia Subaurifera, & Xanthoria Fallax by Coverage only

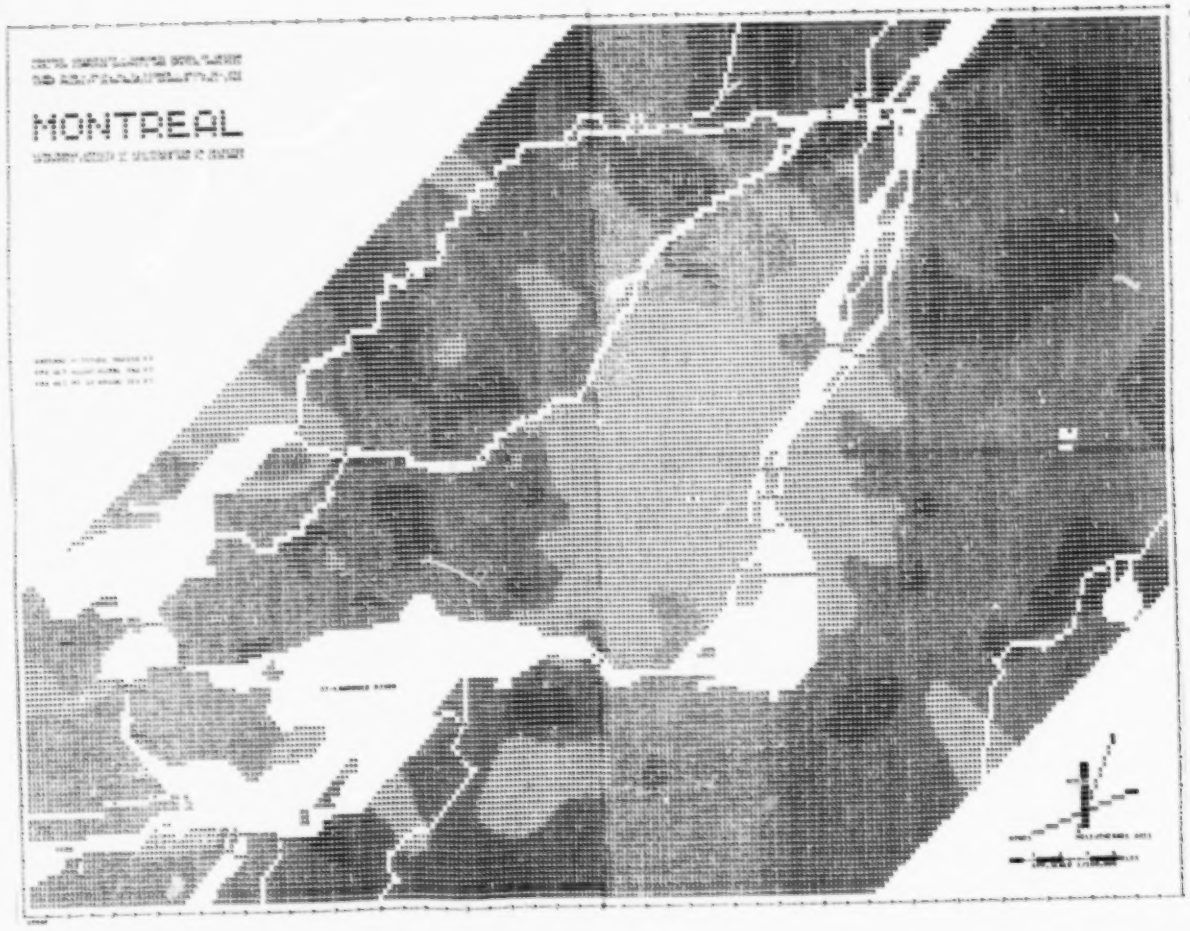


FIGURE E-14

MONTREAL REGION STUDY
Difference between Figures E-13 and E-2
Discrepancies in "Alternate Selection"

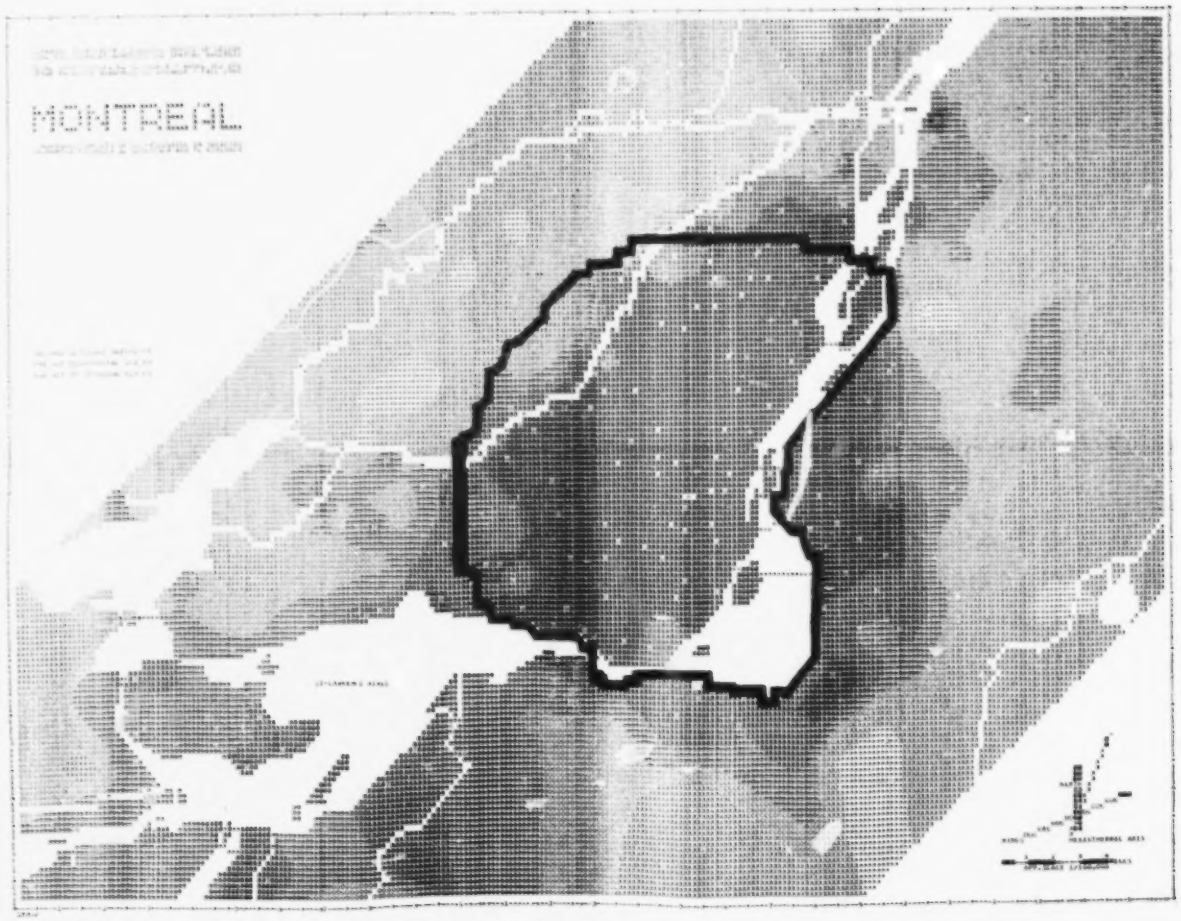


FIGURE E-15

MONTREAL REGION STUDY
"Alternate Selection" Procedure by Coverage
Composite of Separate Urban and Rural Mappings

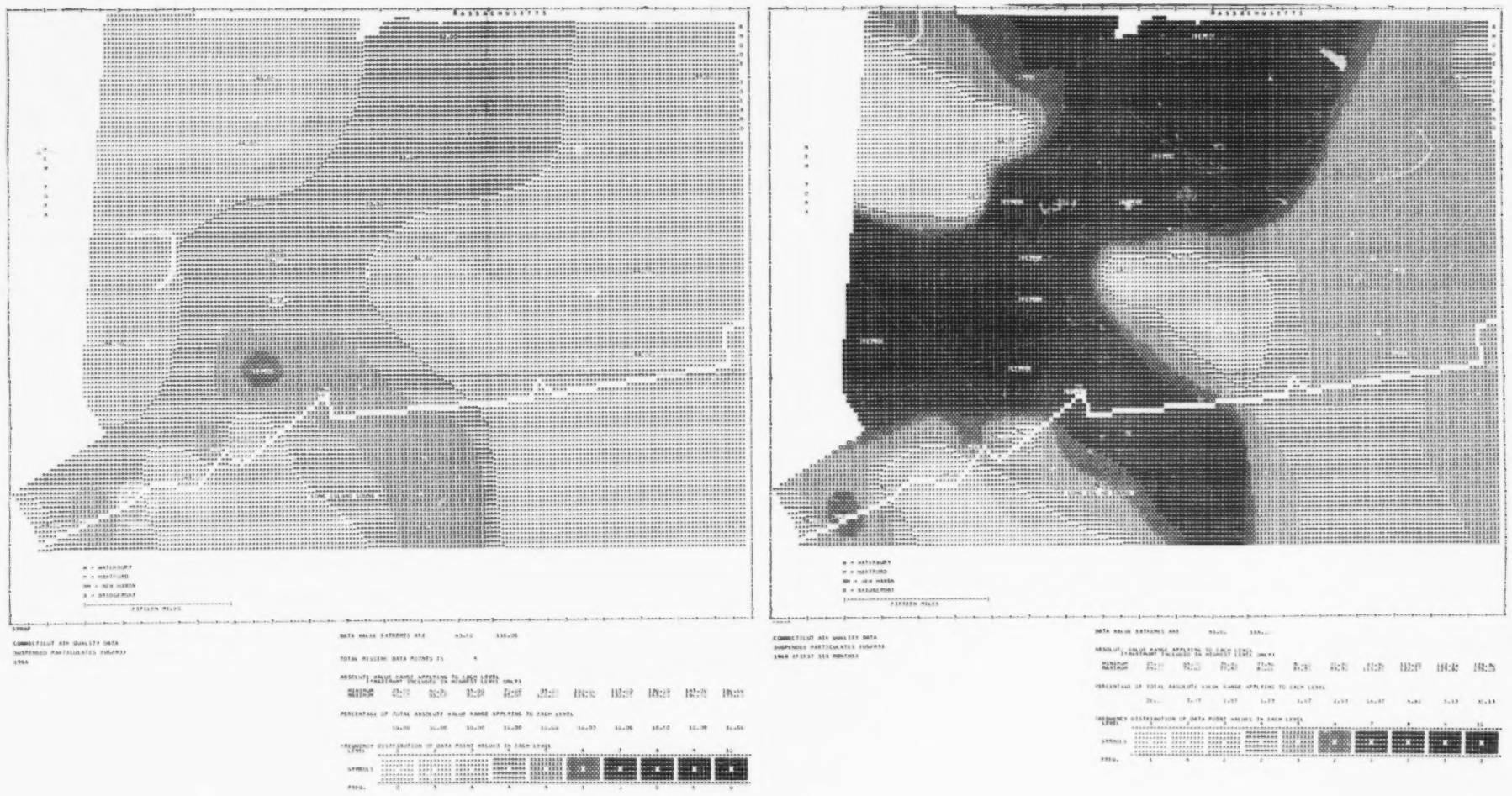
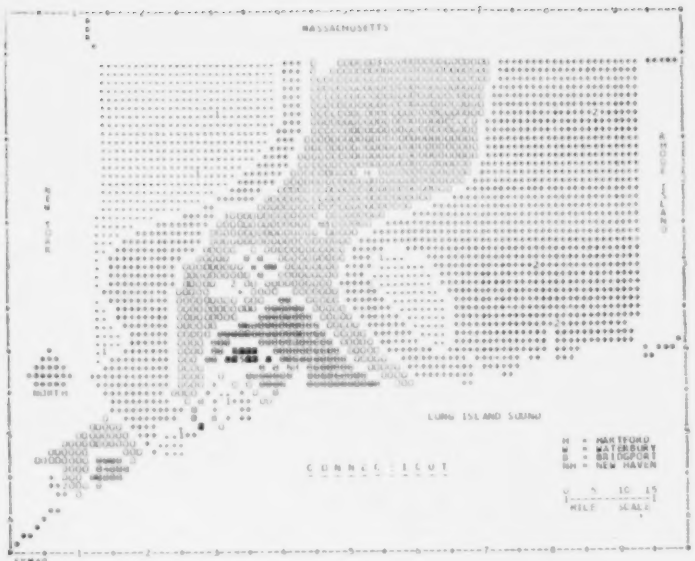


FIGURE F-1

CONNECTICUT STUDY
Connecticut Air Sampling Network
Measured Suspended Particulates Concentration
a. 1966 — 12 months b. 1968 — first 6 months



SYMAP

C CONNECTICUT AIR SAMPLING NETWORK
C SUSPENDED PARTICULATES (UG/M3)
C 1966

DATA VALUE EXTREMES ARE 43.00 110.00

SOURCE- CONNECTICUT STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES DIVISION
AVERAGE OF DAILY LEVELS

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

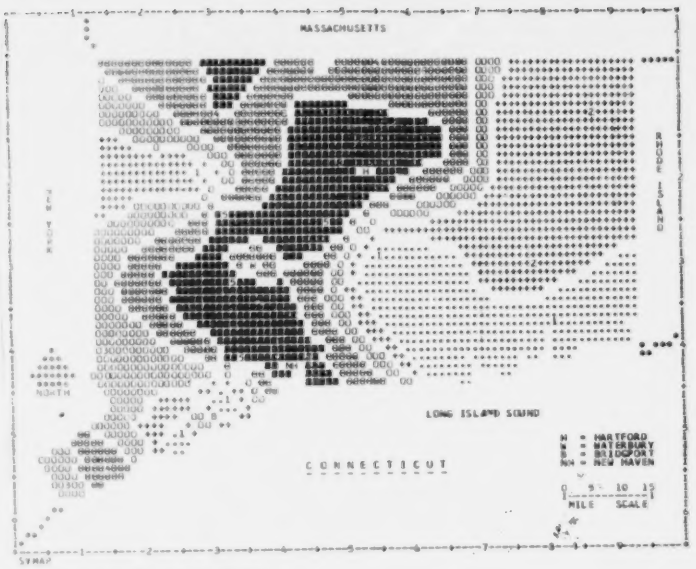
MINIMUM	43.00	56.40	69.80	83.20	96.60
MAXIMUM	56.40	69.80	83.20	96.60	110.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

20.00 20.00 20.00 20.00 20.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS					
FREQ.	6	5	4	3	2



SYMAP

C CONNECTICUT AIR SAMPLING NETWORK
C SUSPENDED PARTICULATES (UG/M3)
C 1967

DATA VALUE EXTREMES ARE 49.00 91.00

SOURCE- CONNECTICUT STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES DIVISION
AVERAGE OF DAILY LEVELS

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

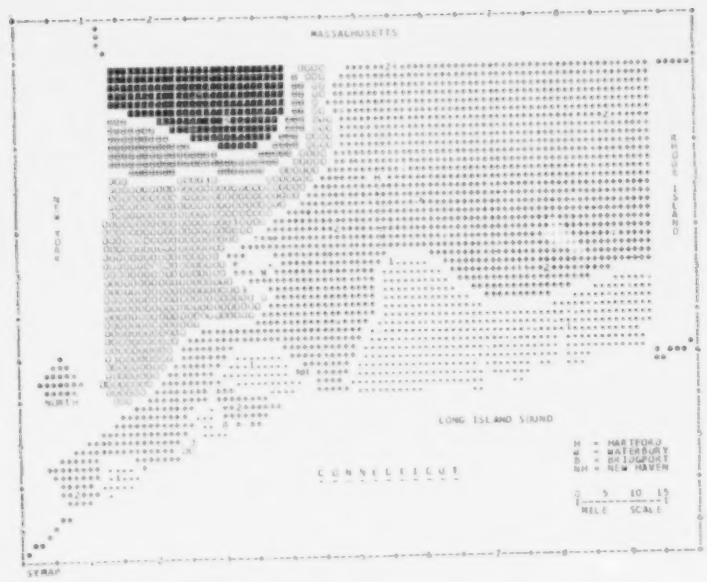
MINIMUM	49.00	57.40	65.80	74.20	82.60
MAXIMUM	57.40	65.80	74.20	82.60	91.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

20.00 20.00 20.00 20.00 20.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS					
FREQ.	9	2	3	4	6



SYMAP

C CONNECTICUT AIR SAMPLING NETWORK
C SUSPENDED PARTICULATES (UG/M3)
C PERCENT CHANGE 1966 - 1967

DATA VALUE EXTREMES ARE -28.00 78.00

SOURCE- CONNECTICUT STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES DIVISION
AVERAGE OF DAILY LEVELS

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

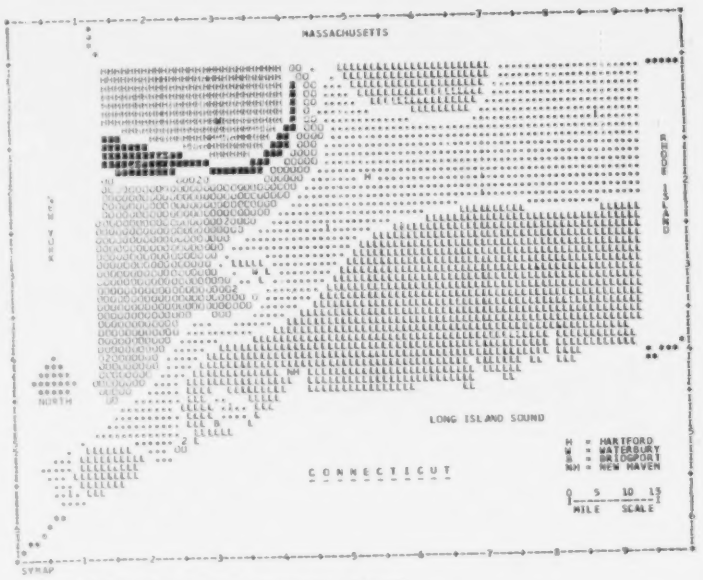
MINIMUM	-28.00	-10.00	10.00	30.00	50.00
MAXIMUM	-10.00	10.00	30.00	50.00	78.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

20.00 20.00 20.00 20.00 20.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
SYMBOLS					
FREQ.	7	3	4	5	4



SYMAP

C PERCENT INCREASE IN SUSPENDED PARTICULATES, 1966-1967
C L = LOW (BELOW ZERO) H = HIGH (ABOVE 50 PERCENT)
C 1 = -15 PERCENT 2 = 15-35 PERCENT 3 = 35-50 PERCENT

DATA VALUE EXTREMES ARE -28.00 78.00

SOURCE- CONNECTICUT STATE DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES DIVISION
AVERAGE OF DAILY LEVELS

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	BELOW 0.00	0.00	15.00	35.00	ABOVE 50.00
MAXIMUM	0.00	15.00	35.00	50.00	

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

20.00 40.00 30.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	L	1	2	3	H
SYMBOLS					
FREQ.	9	5	5	6	4

FIGURE F-2

CONNECTICUT STUDY
Connecticut Air Sampling Network
SYMAP Correspondence Course Examples
Measured Suspended Particulates Concentration

a. 1966 b. 1967
c. Percent Change — 1966 to 1967 d. Percent Change — Contour Levels Specified

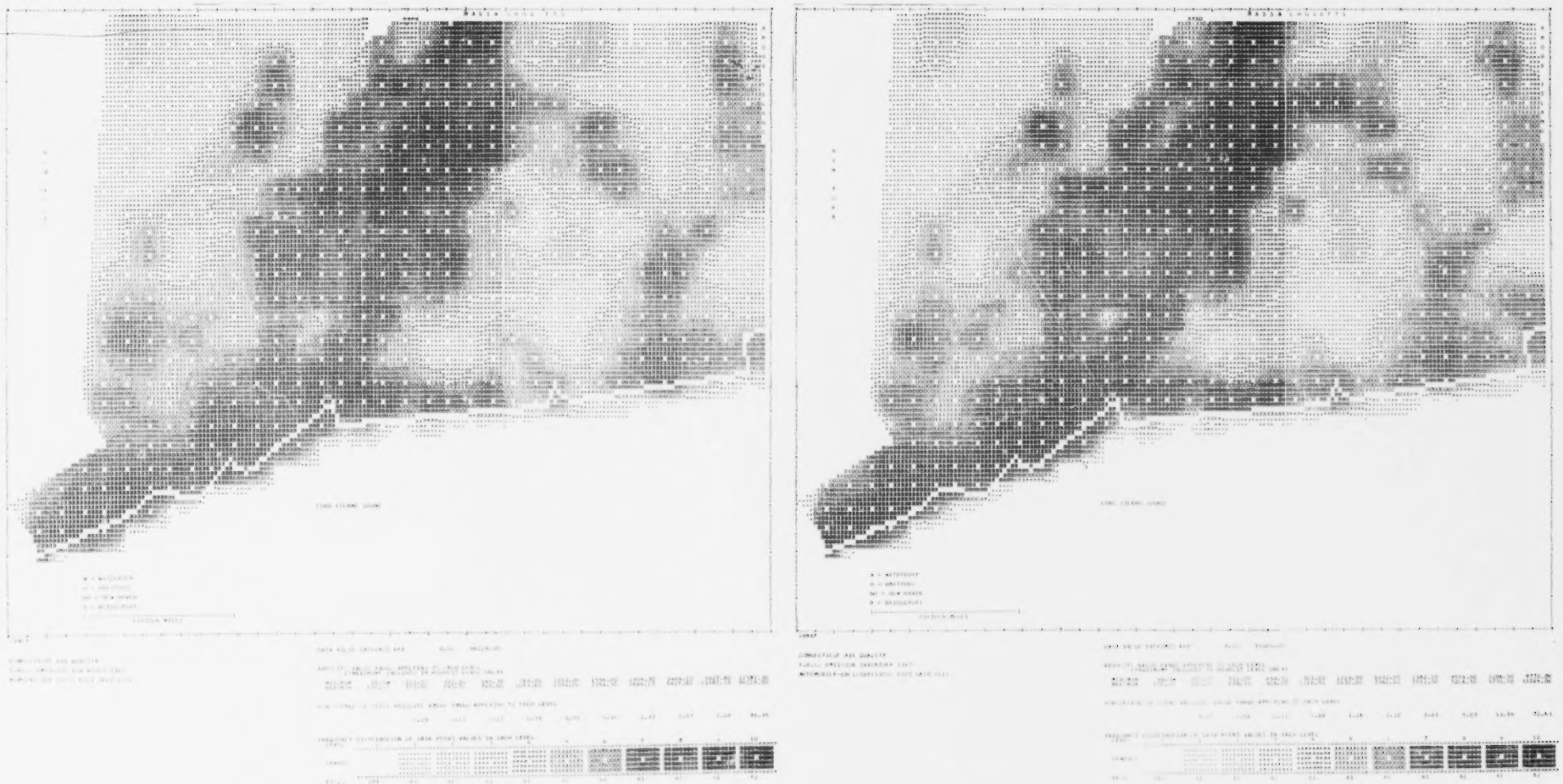


FIGURE F-3

CONNECTICUT STUDY
Travelers Research Center Emission Inventory
a. Population-related Emissions
b. Automobile-related Emissions

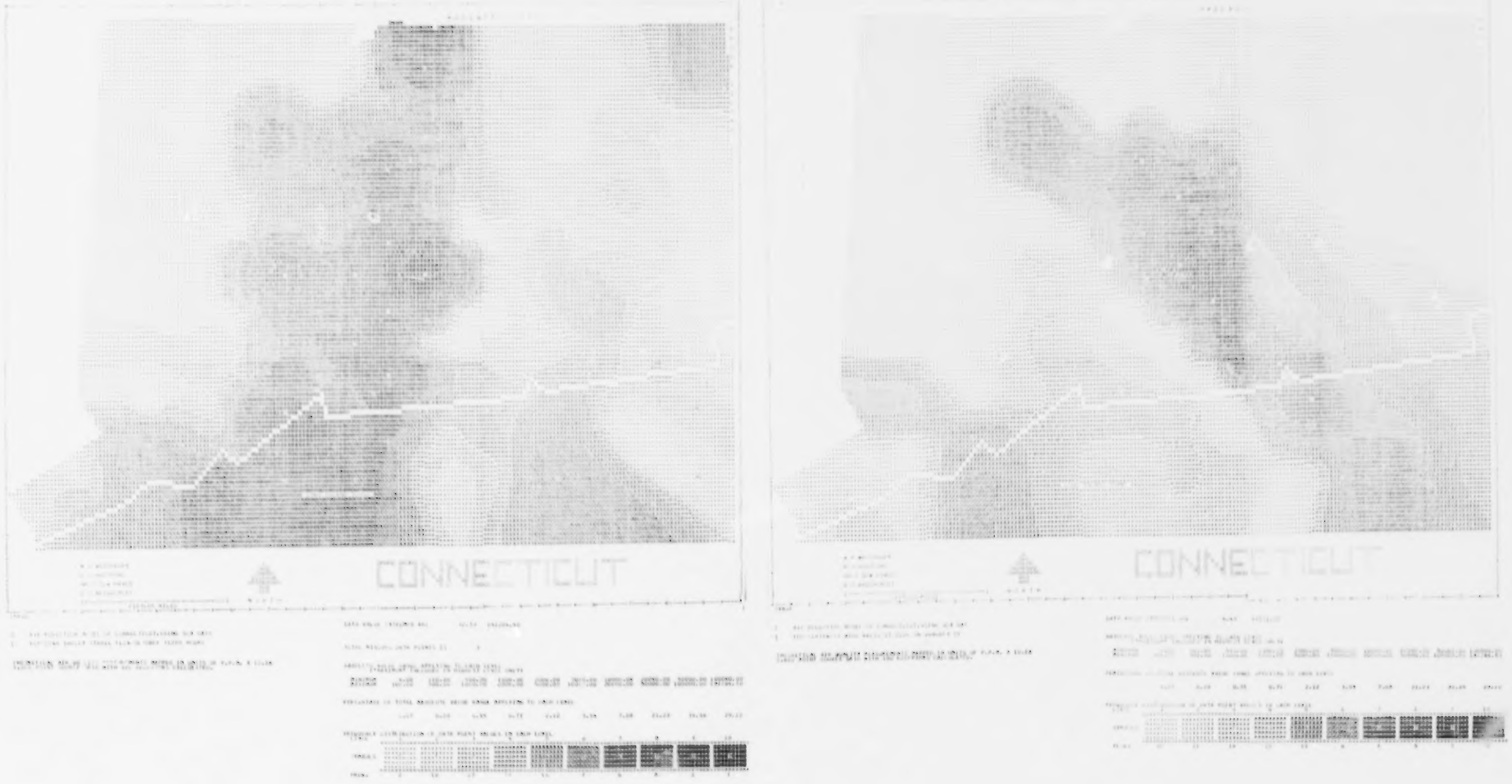


FIGURE F-4

CONNECTICUT STUDY
Travelers Research Center SOx Modeling
a. Down Valley Stable Flow — October Noon
b. Northwest Wind — January Midnight

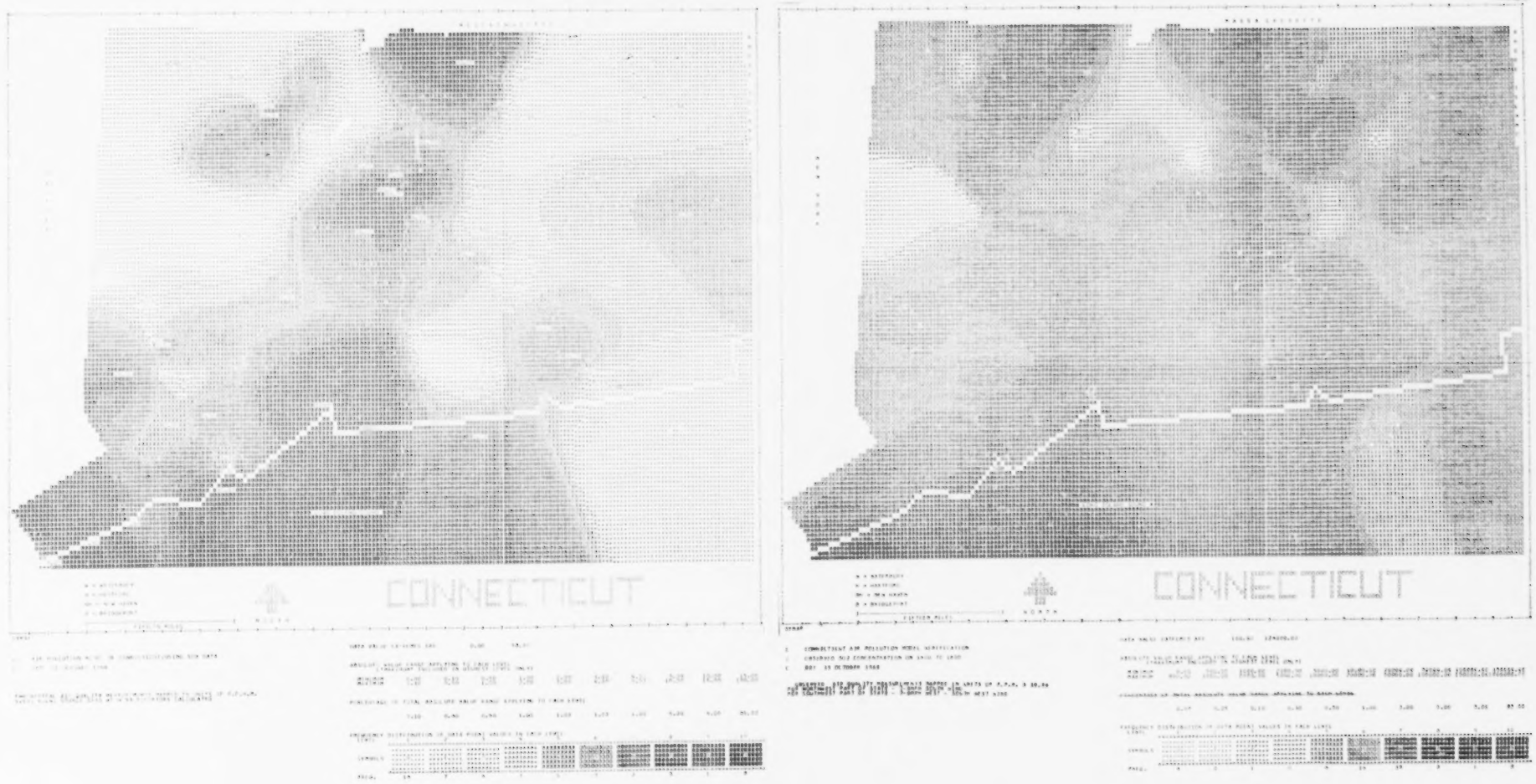
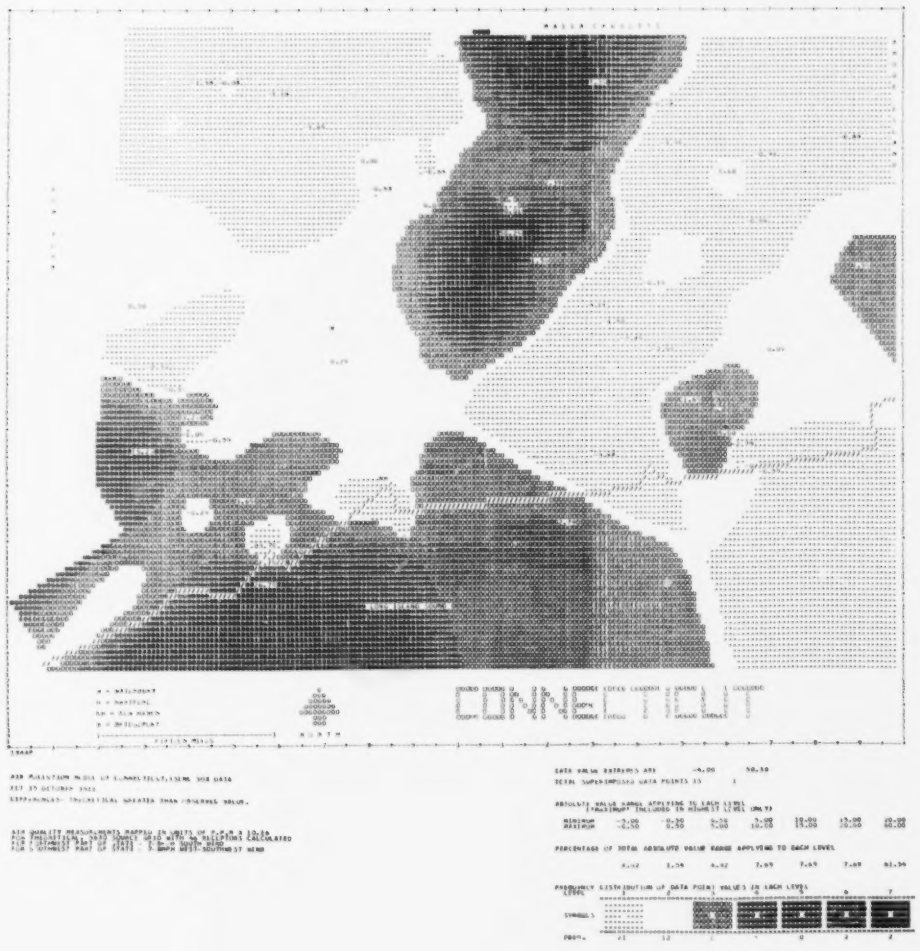


FIGURE F-5

CONNECTICUT STUDY
Travelers Research Center SOx Modeling
a. Calculated Values — October 15, 1968
b. Observed Values — October 15, 1968



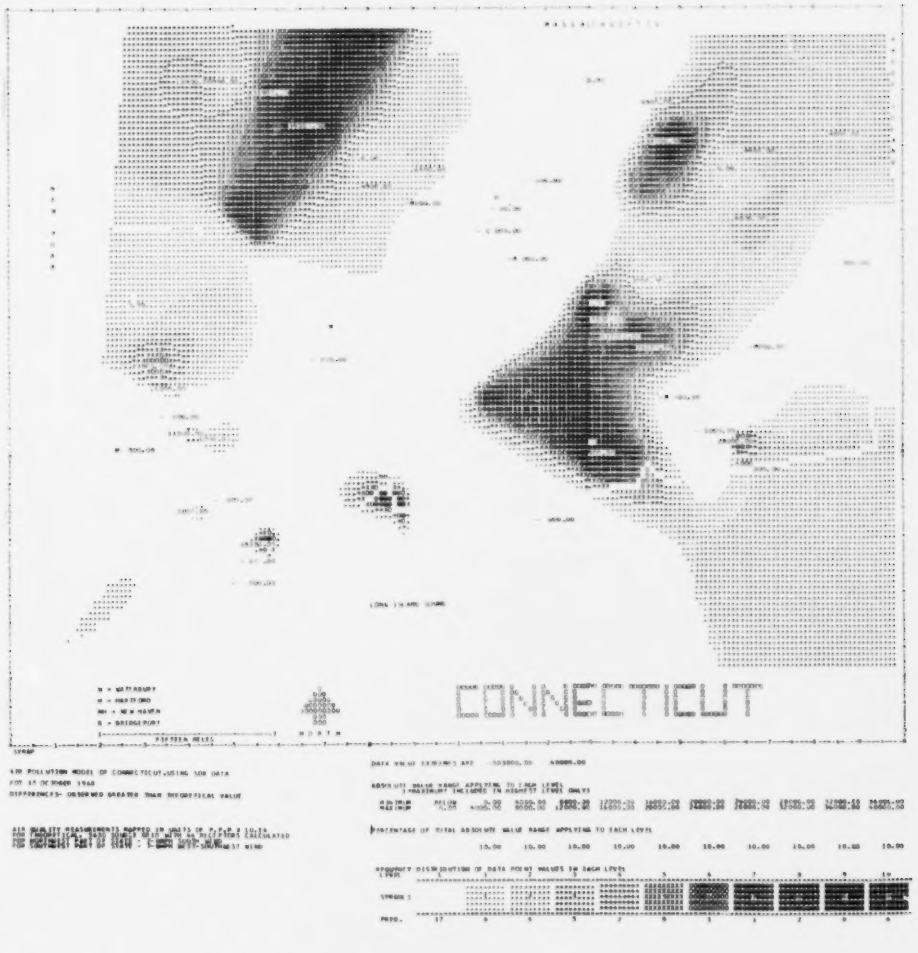


FIGURE F-6

CONNECTICUT STUDY
Travelers Research Center SOx Modeling
Values for October 15, 1968
a. Calculated Greater than Observed
b. Observed Greater than Calculated

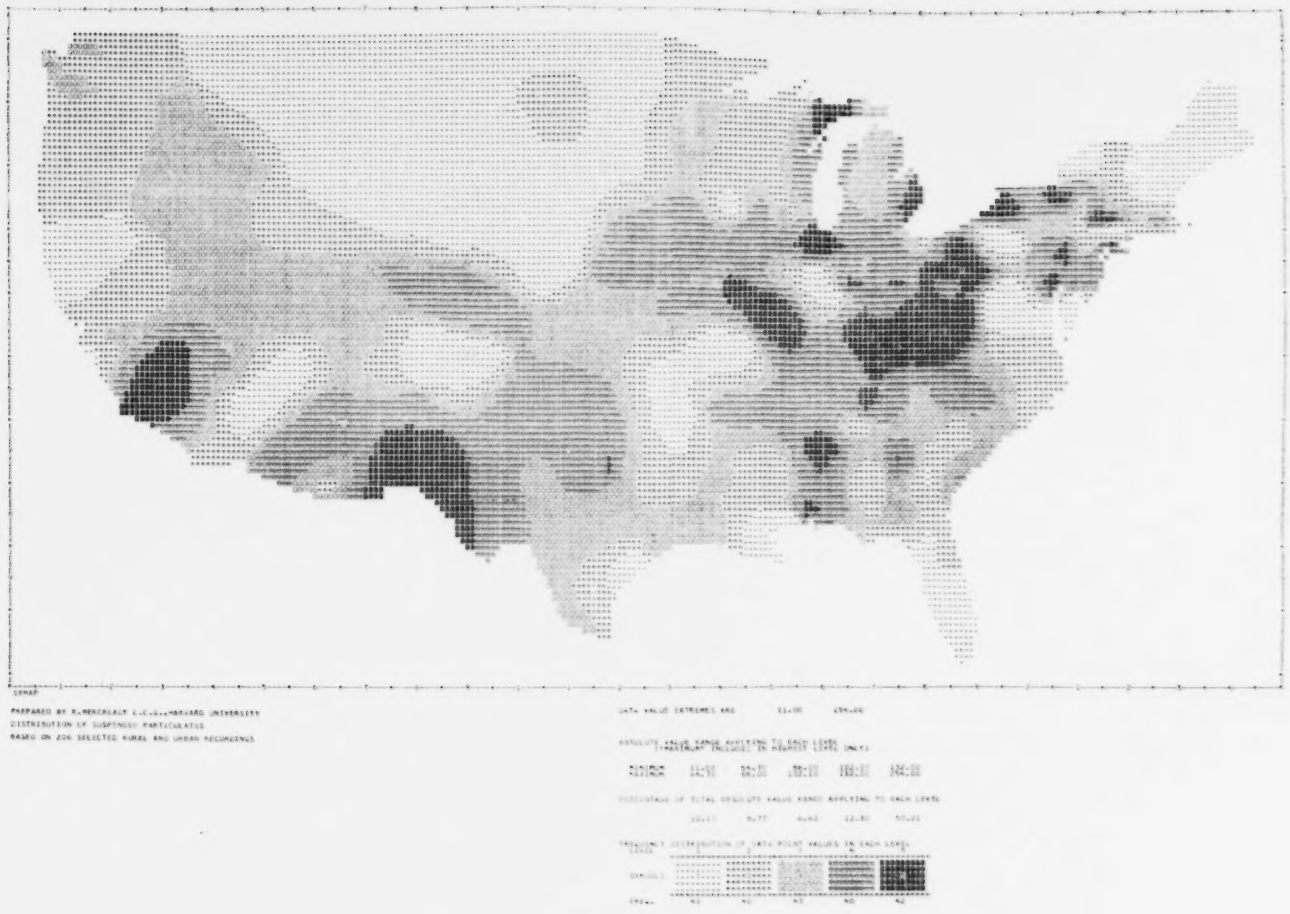


FIGURE G-1

SOUTHERN NEW ENGLAND STUDY
Concentration of Suspended Particulates
Based on 206 Selected Urban and Rural Recordings
a. Equal Number of Data Points in Each Level
b. Equal Interval Contour Levels

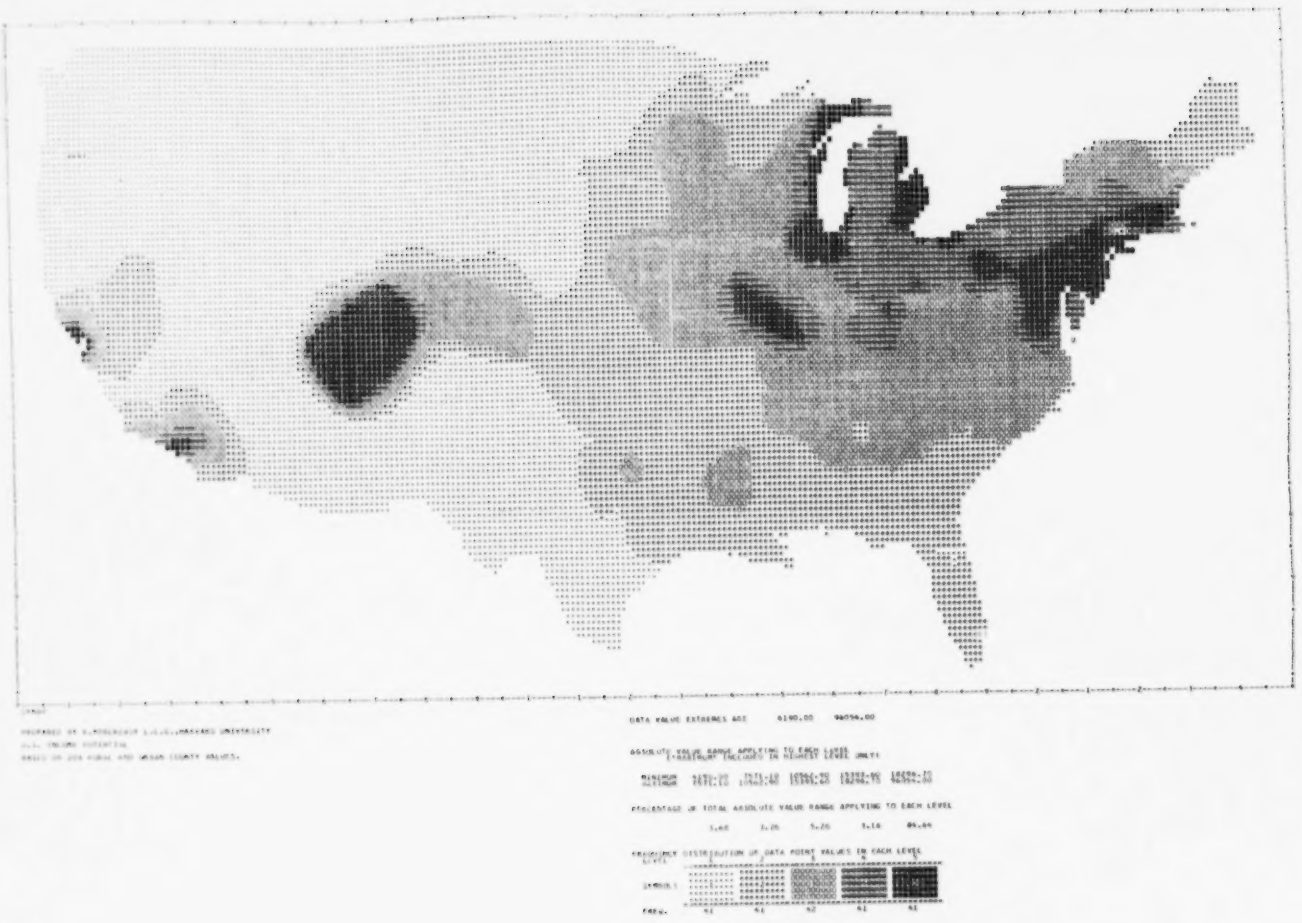


FIGURE G-2

SOUTHERN NEW ENGLAND STUDY
United States Income Potential
Based on 206 Urban and Rural County Values
a. Equal Number of Data Points in Each Level
b. Equal Interval Contour Levels

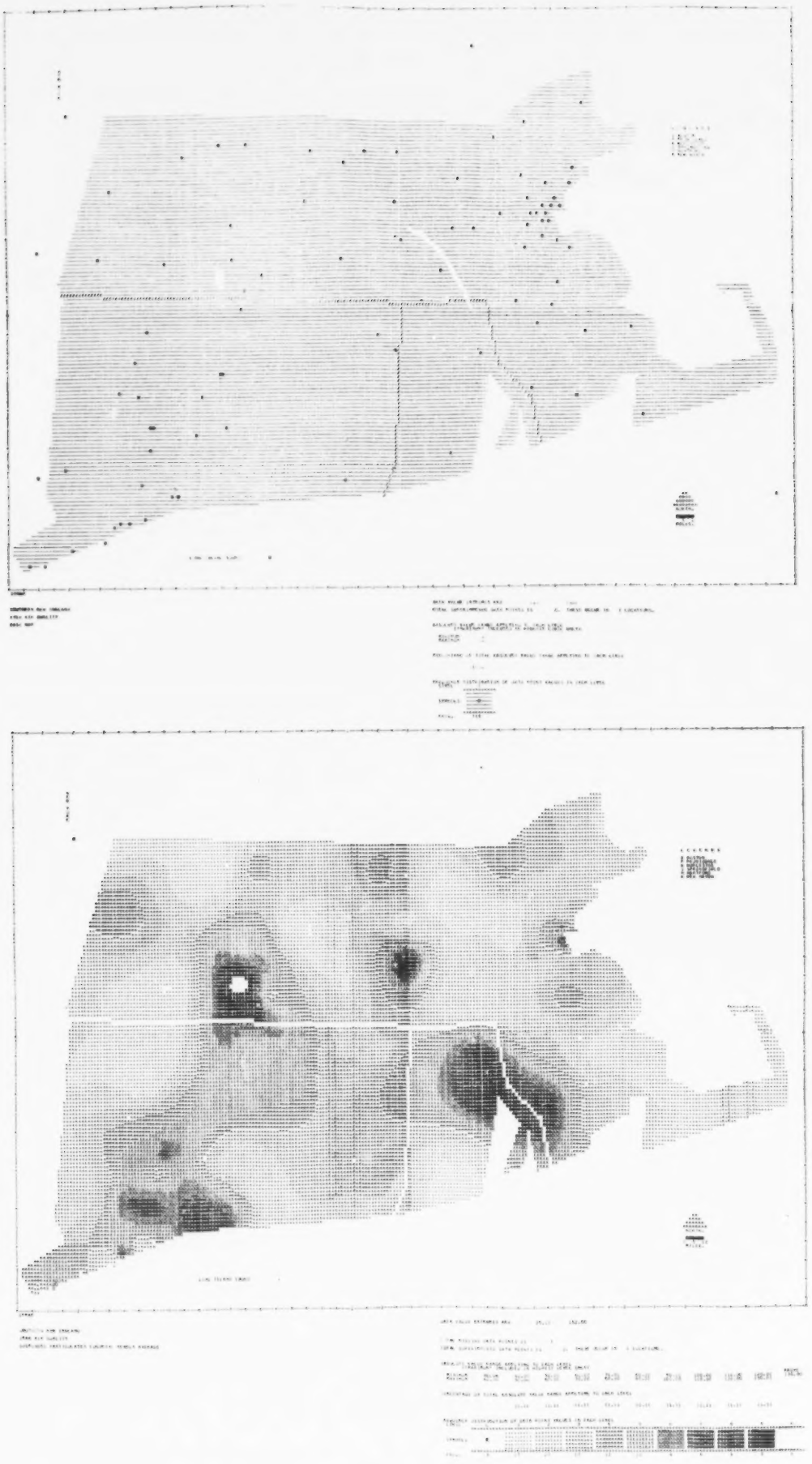


FIGURE G-3

SOUTHERN NEW ENGLAND STUDY
Concentration of Suspended Particulates
a. Base Map of Monitoring Stations
and Background Data Points
b. Based on Actual and Estimated Values

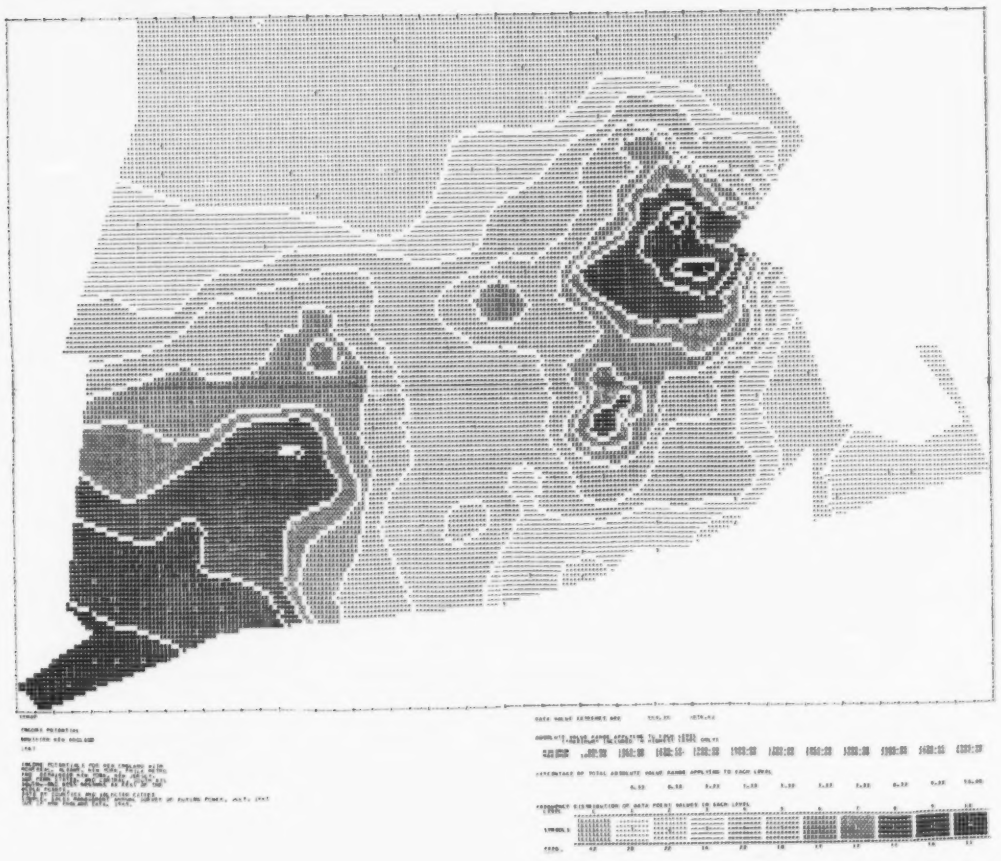


FIGURE G-4

SOUTHERN NEW ENGLAND STUDY
Income Potential Calculated at City & County Data Points
a. Surface Based on Counties Only
b. Surface Based on Cities and Counties

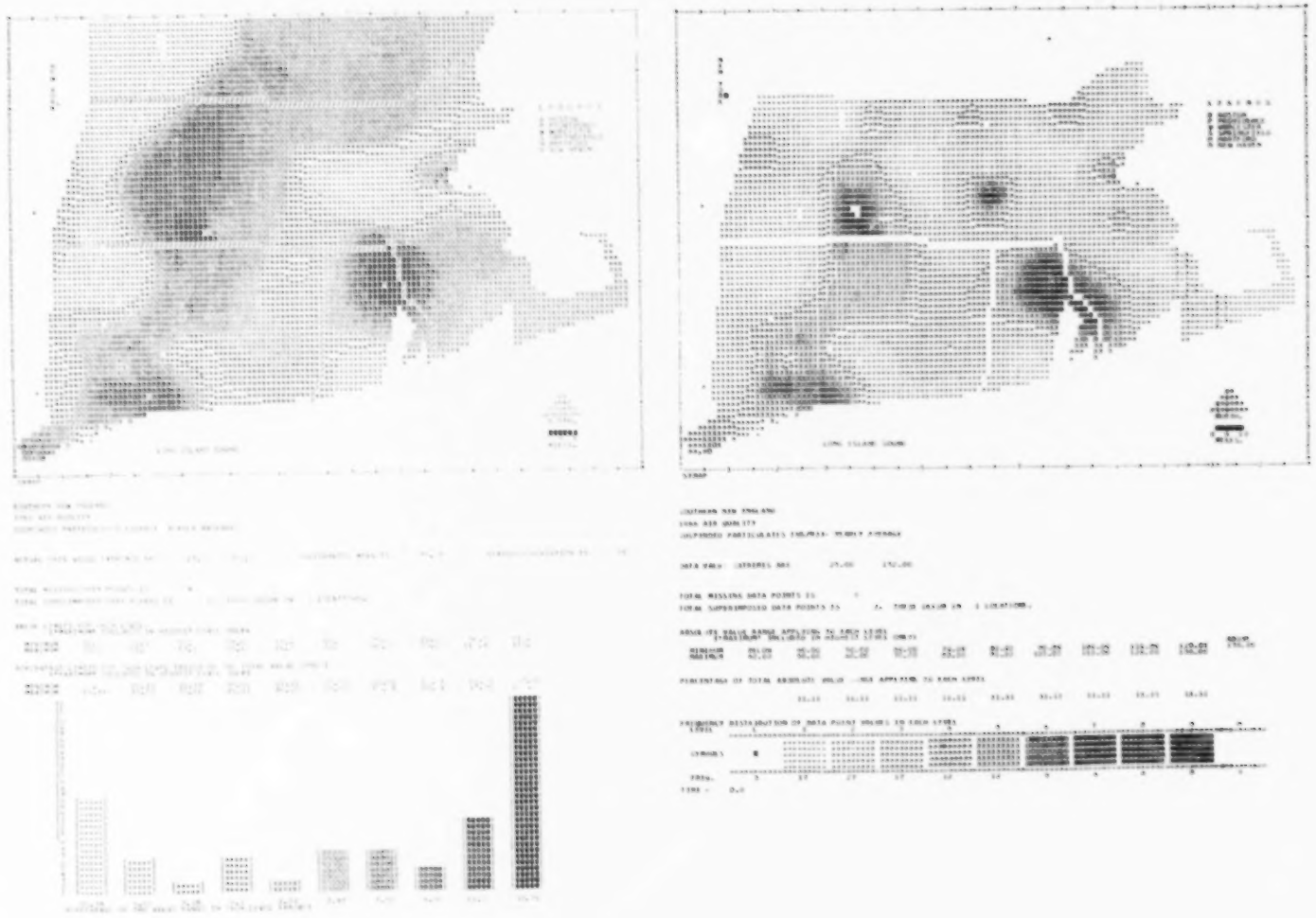
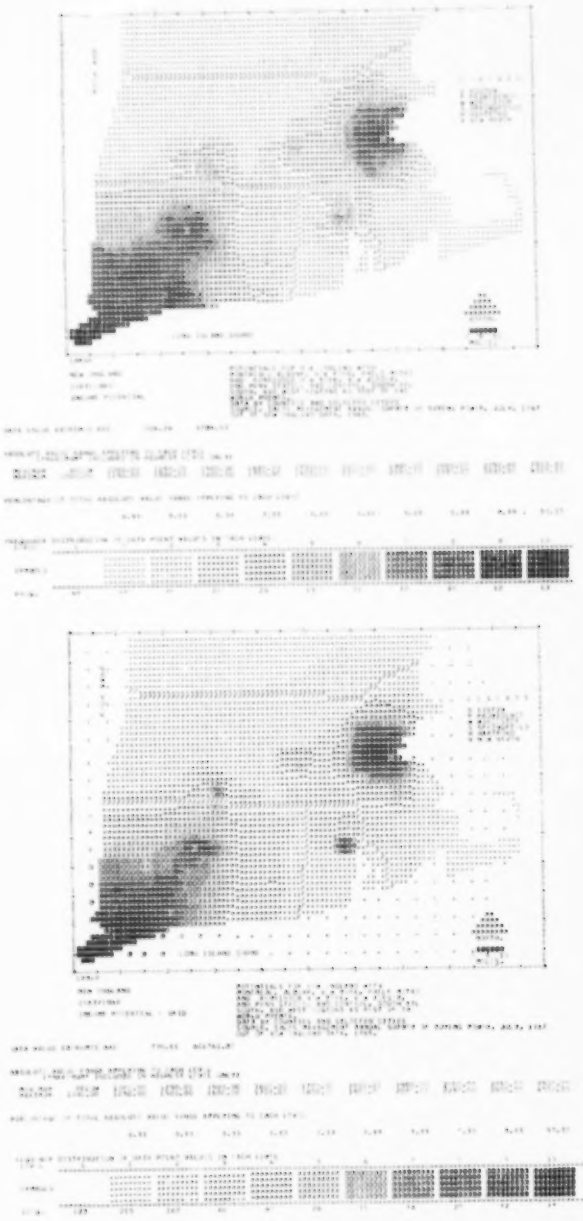
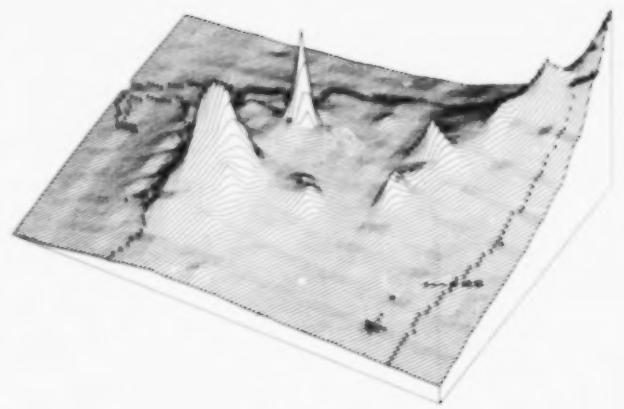


FIGURE G-5

SOUTHERN NEW ENGLAND STUDY
Concentration of Suspended Particulates
a. Based on Measured 1966 Values Only
b. Based on Actual and Estimated Values





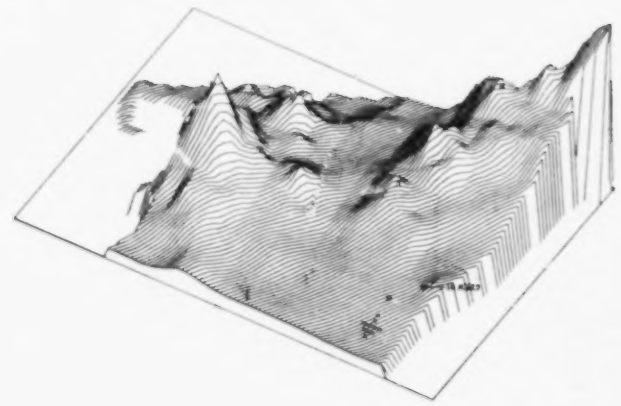


FIGURE G-6

SOUTHERN NEW ENGLAND STUDY
Income Potential Surface
a. Calculated at City and County Data Points
b. Oblique View of a.
c. Calculated on an 8-mile Grid
d. Oblique View of b.

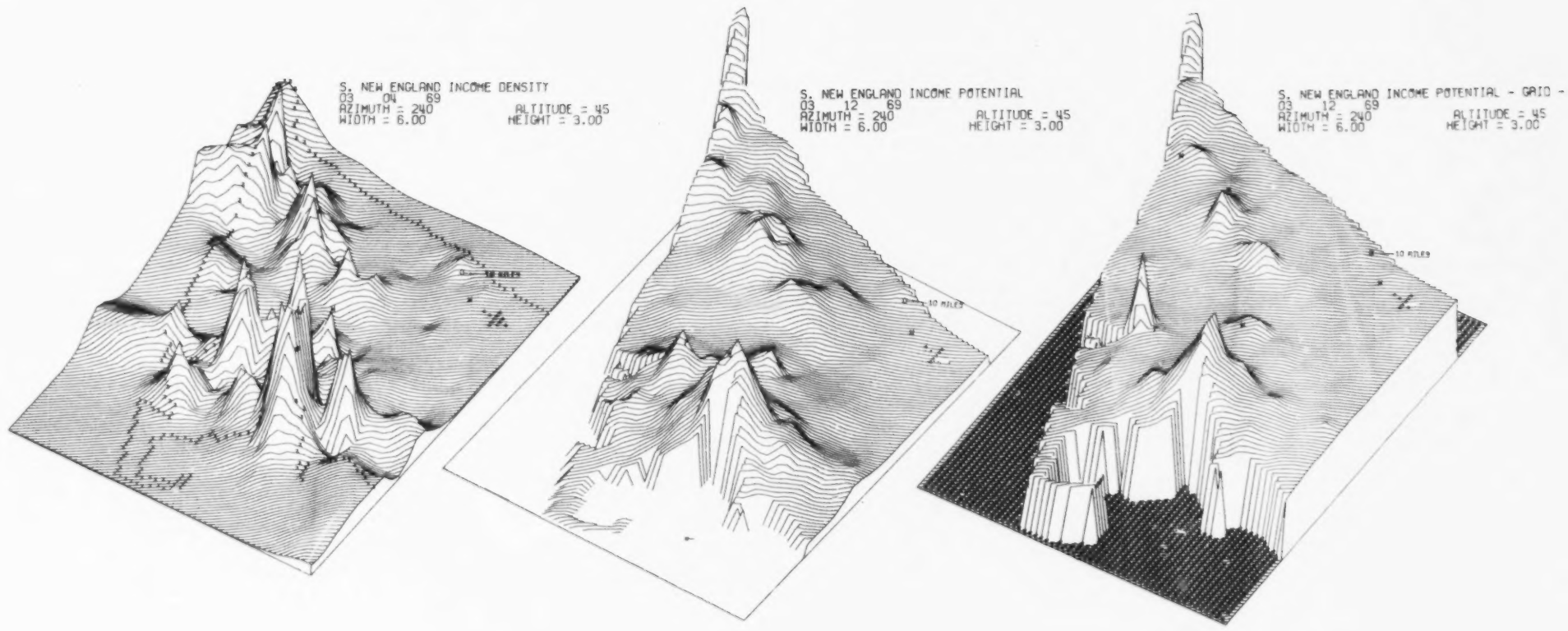


FIGURE G-7

SOUTHERN NEW ENGLAND STUDY
Comparison of Income Surfaces — Oblique Views
a. Income Density
b. Income Potential at Data Points
c. Income Potential on an 8-mile Grid

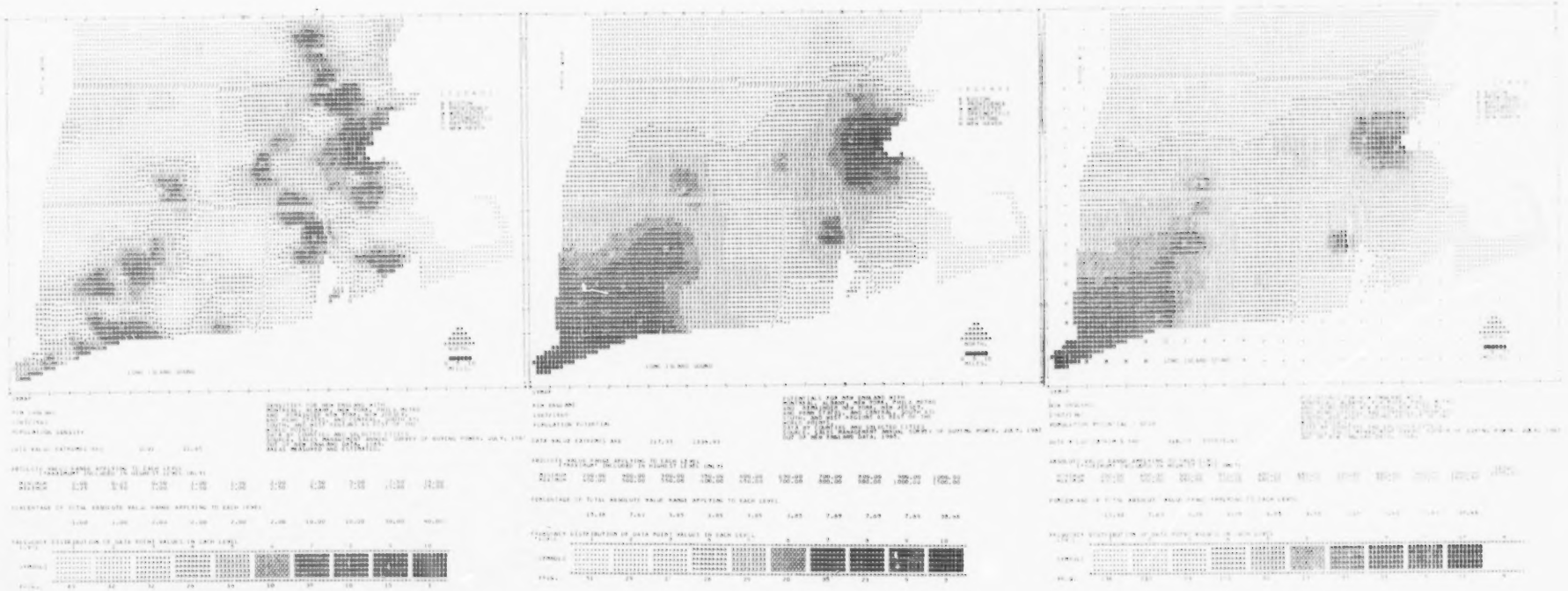
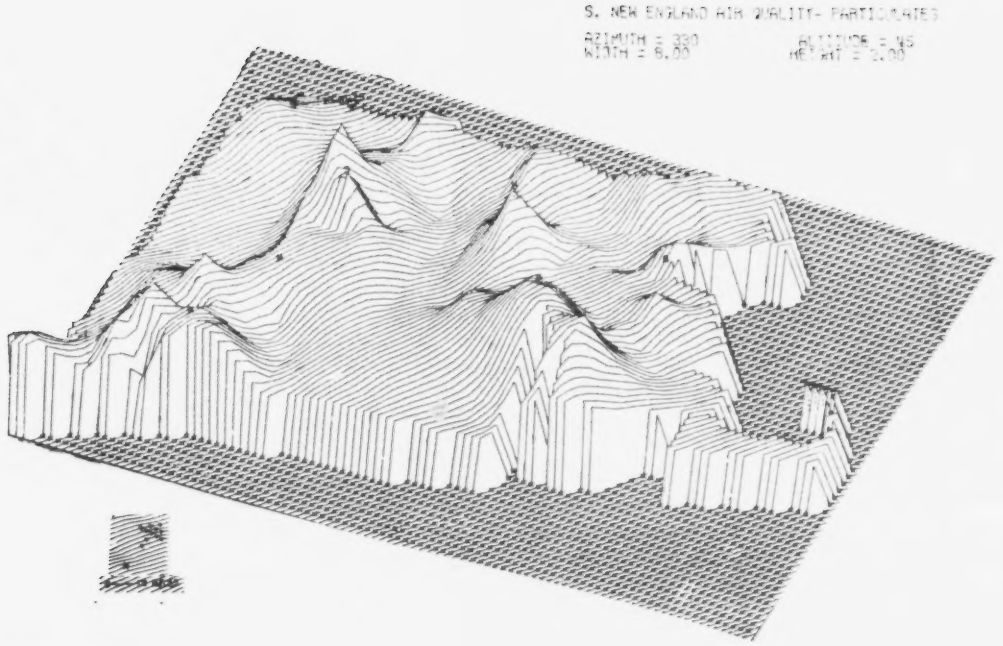


FIGURE G-8

SOUTHERN NEW ENGLAND STUDY
Comparison of Population Surfaces
a. Population Density
b. Population Potential at Data Points
c. Population Potential on an 8-mile Grid



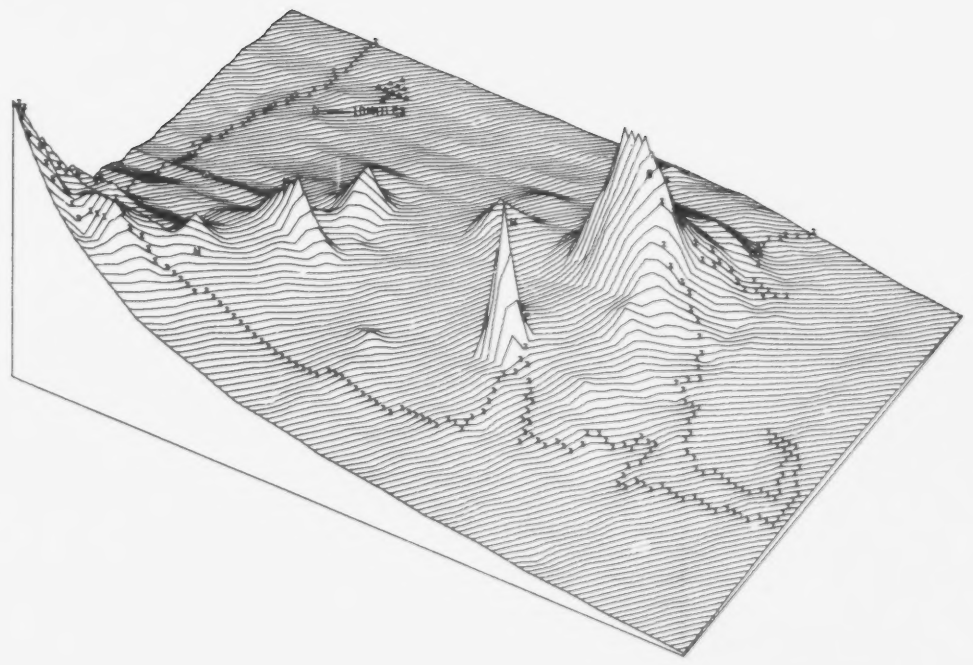
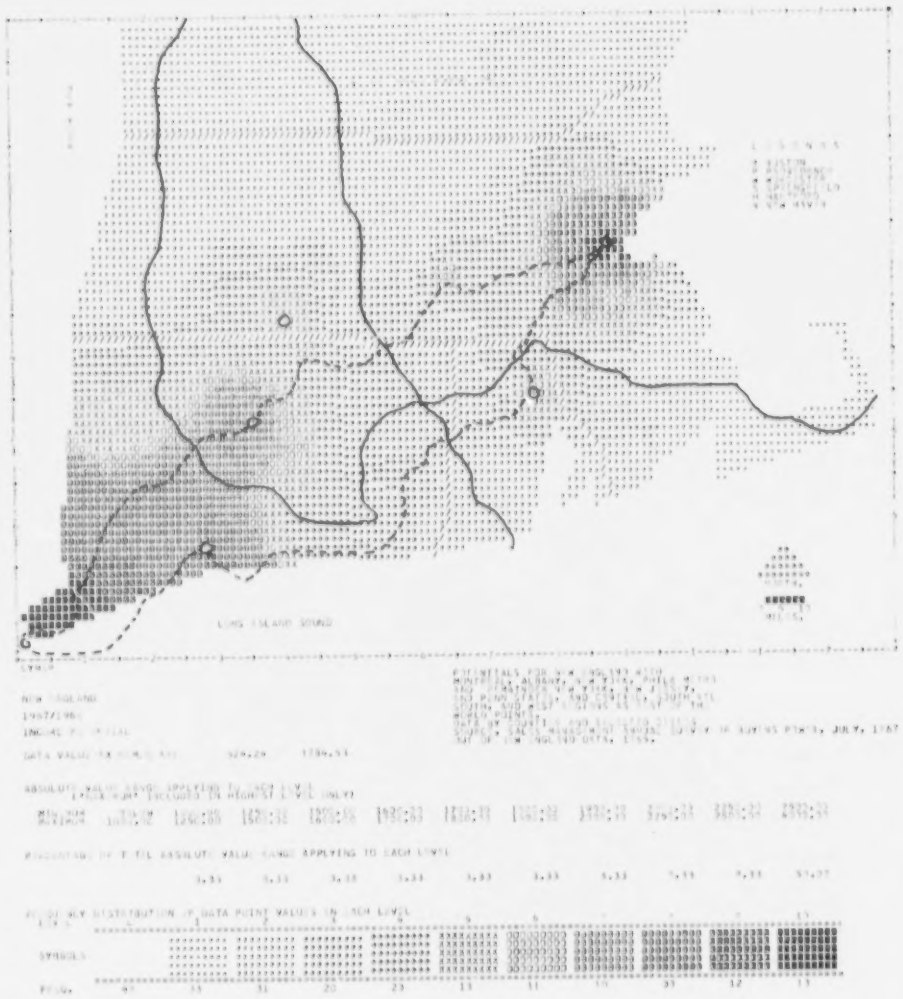
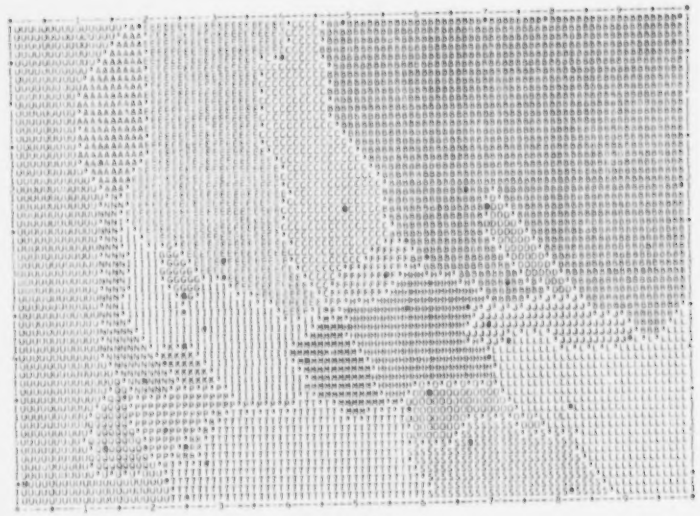


FIGURE G-9

SOUTHERN NEW ENGLAND STUDY
Comparison of Air Pollution and Income Potential Surfaces
Oblique Views
a. Concentration of Suspended Particulates
Actual and Estimated Values Used
b. Income Potential — Calculated on an 8-mile Grid





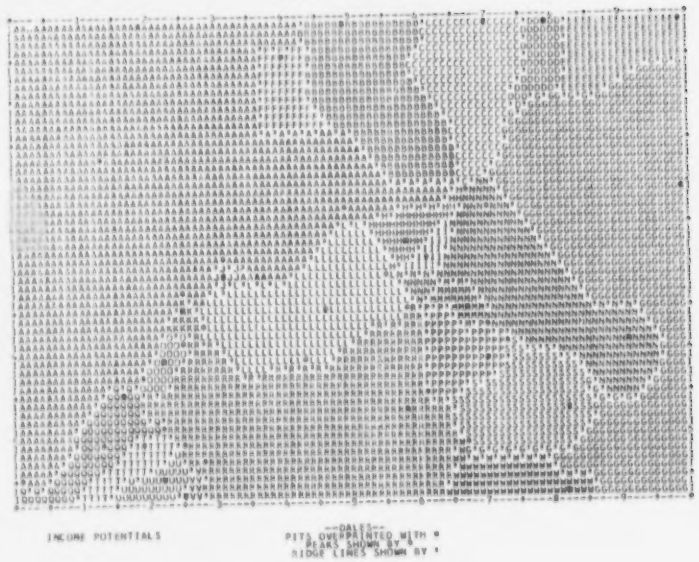


FIGURE G-10

SOUTHERN NEW ENGLAND STUDY
Critical Features of Income Potential Surface
a. Income Potential Surface
b. Hills and Course Lines
c. Dales and Ridge Lines

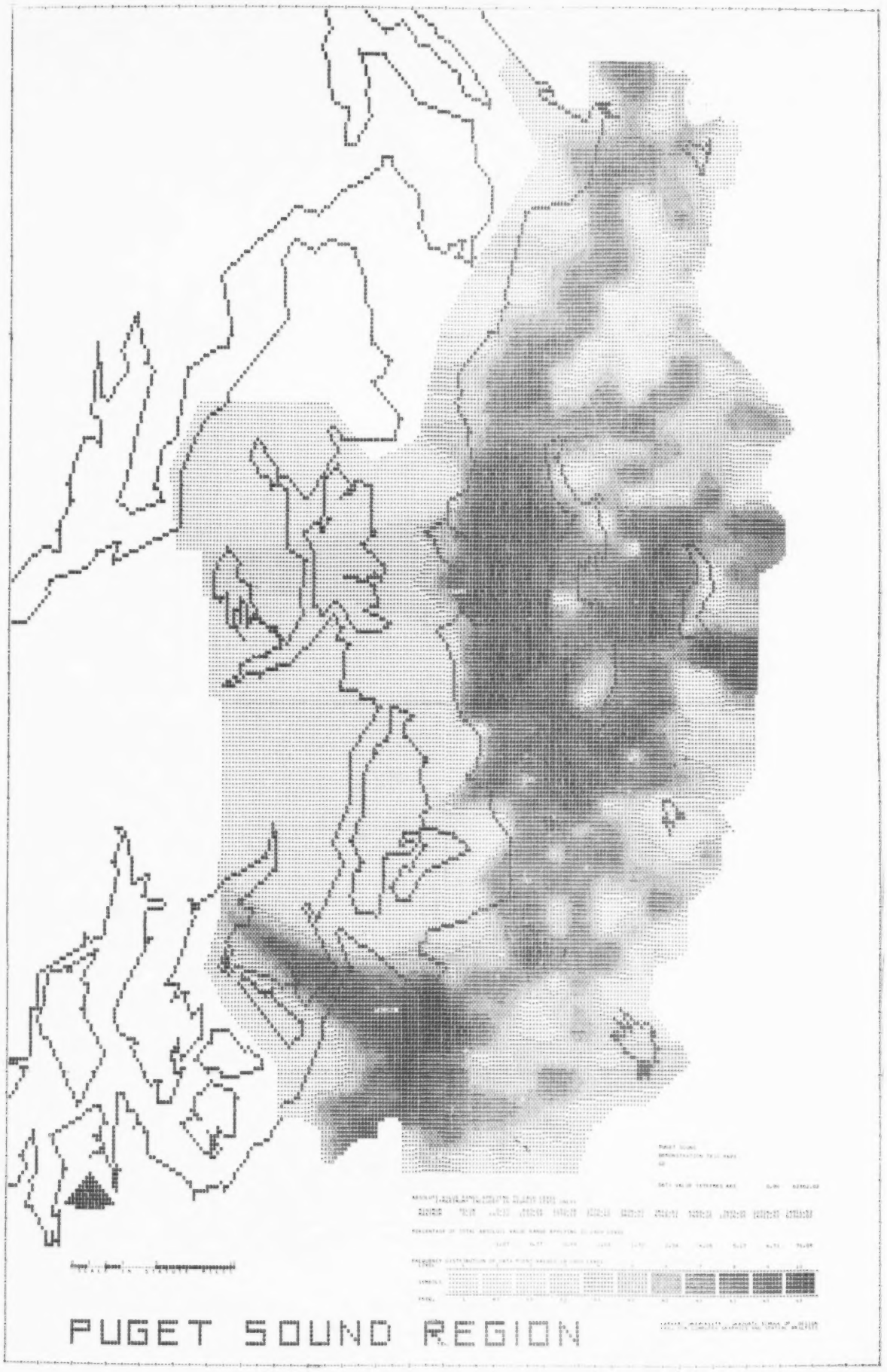


FIGURE H-1

PUGET SOUND REGION STUDY
Carbon Monoxide Motor Vehicle Emissions
Cities and Corridors Plan — System 35

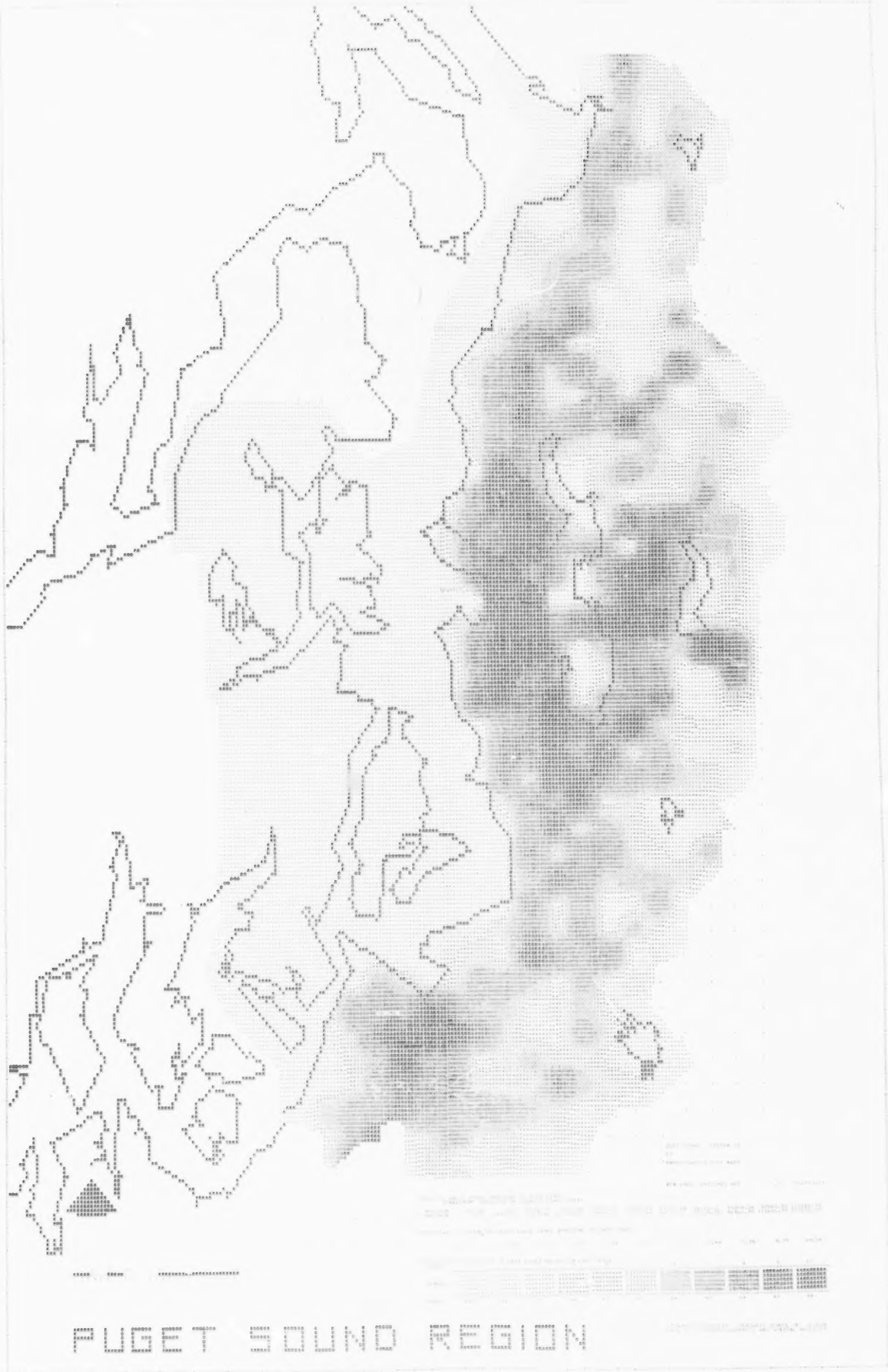


FIGURE H-2

PUGET SOUND REGION STUDY
Carbon Dioxide Motor Vehicle Emissions
Cities and Corridors Plan — System 35

FIGURE H-3

PUGET SOUND REGION STUDY
Hydrocarbon Motor Vehicle Emissions
Cities and Corridors Plan — System 35

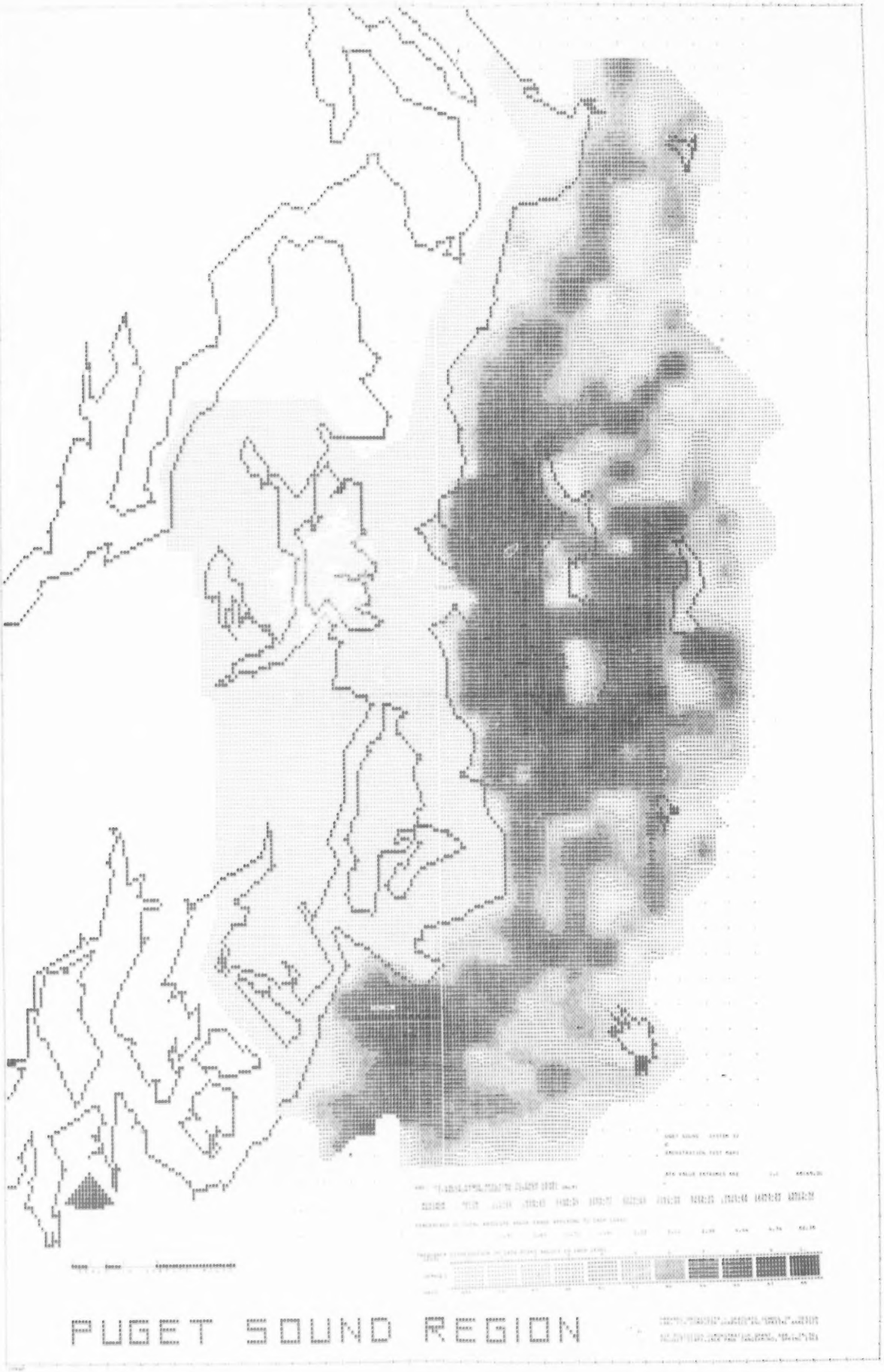


FIGURE H-4

PUGET SOUND REGION STUDY
Carbon Monoxide Motor Vehicle Emissions
Continuation of Existing Trends — System 32

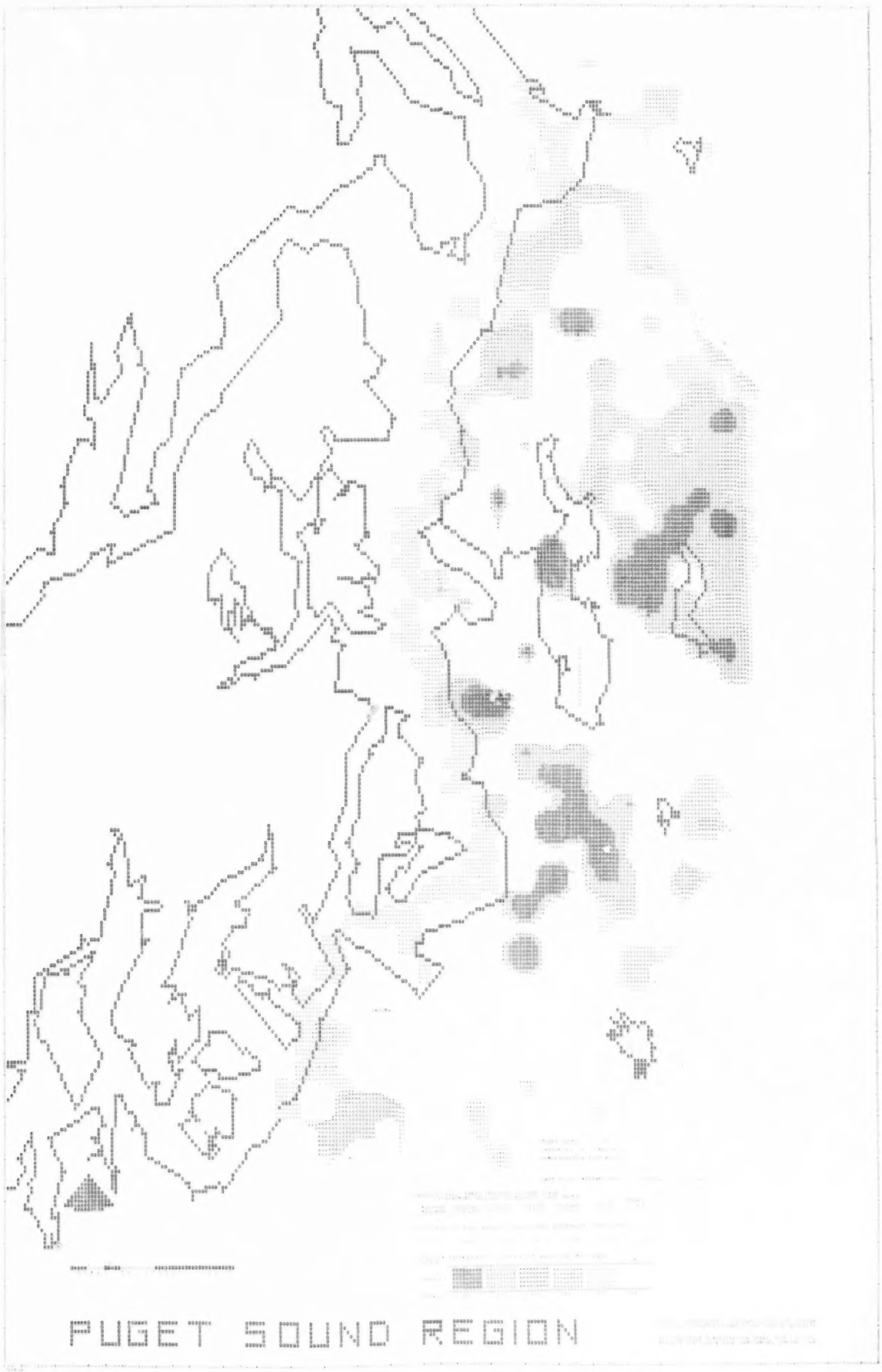


FIGURE H-5

PUGET SOUND REGION STUDY
Differences in Carbon Monoxide Motor Vehicle Emissions
System 35 Exceeds System 32

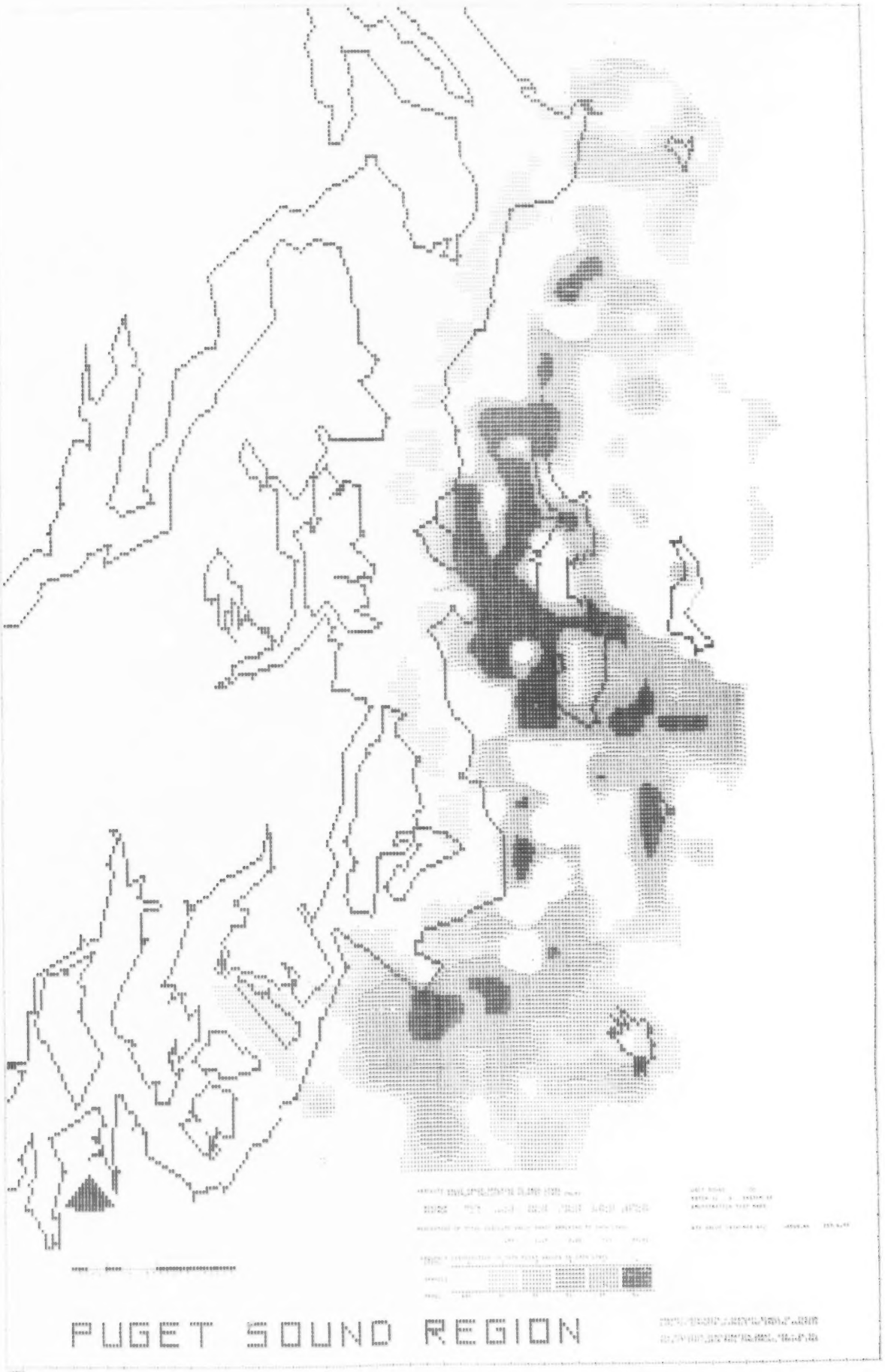


FIGURE H-6

PUGET SOUND REGION STUDY
Differences in Carbon Monoxide Motor Vehicle Emissions
System 32 Exceeds System 35

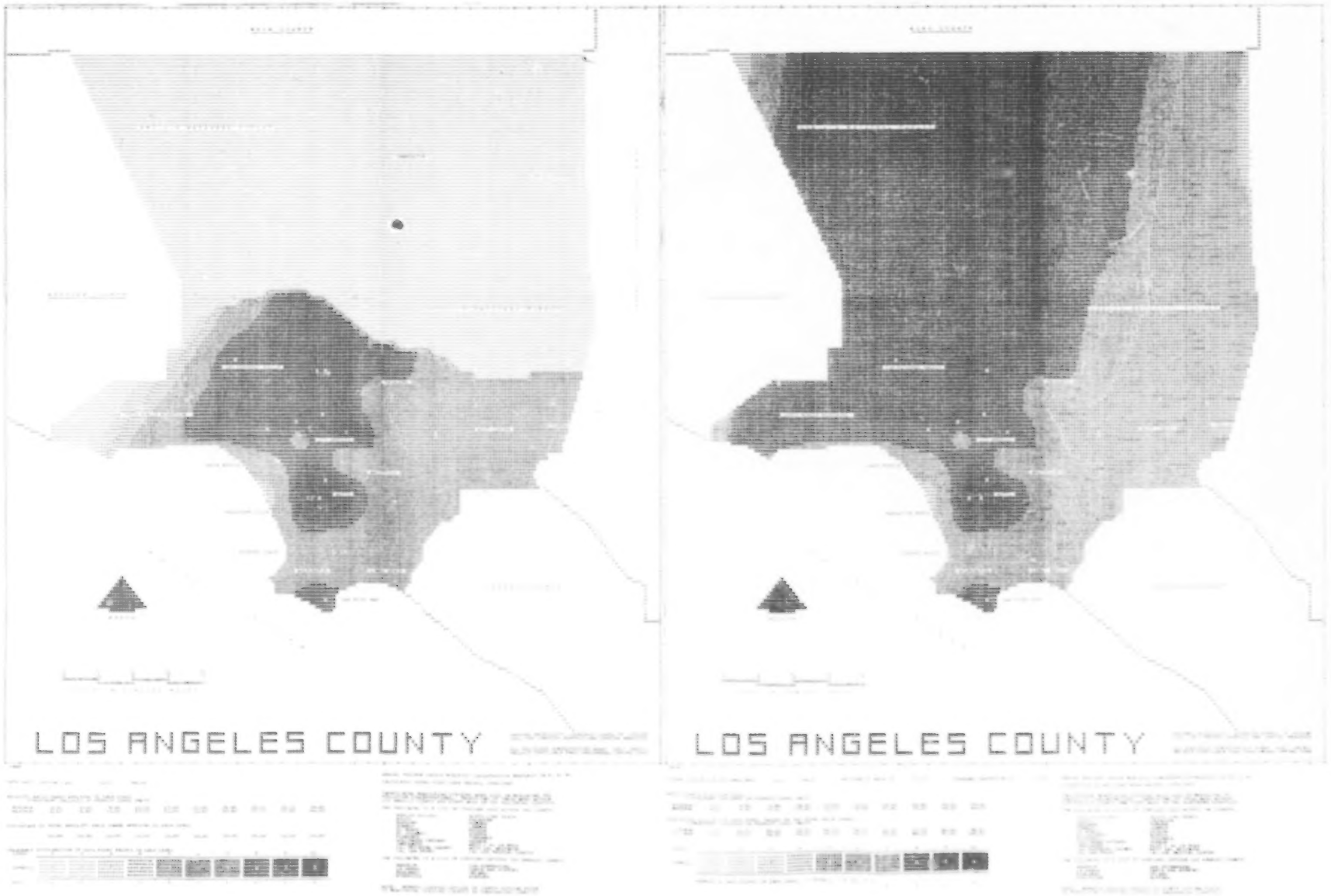


FIGURE I-1

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values 1956-1967
a. Best Use of Barriers and Mountain Background Points
b. Measured Data Points Only

FIGURE I-2

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values 1956-1967
Use of Mountain Background Points and Barrier
a. 2 Full-strenth Barriers and 5 Mountain Points
b. 8 Mountain Points

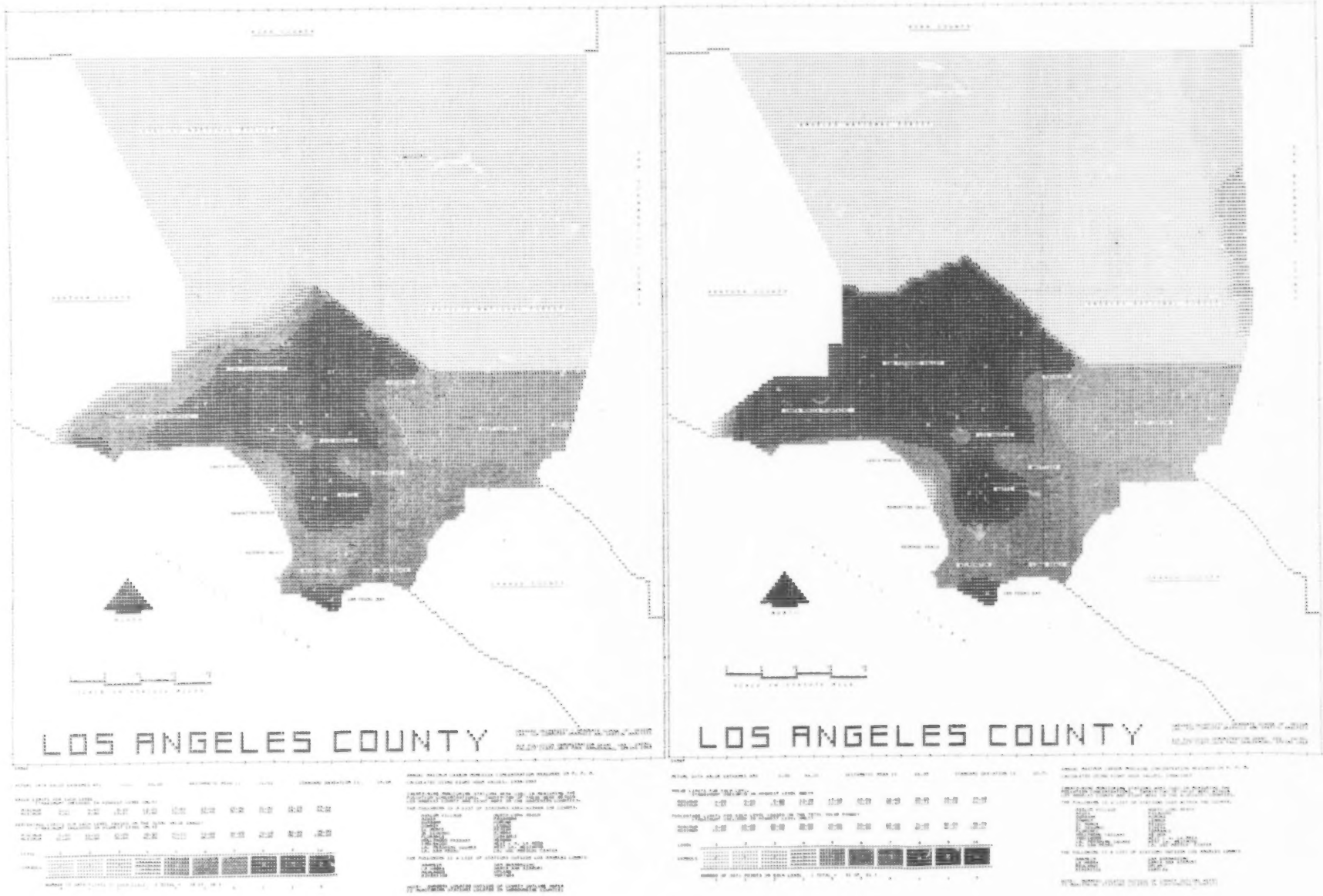


FIGURE I-3

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values 1956-1967
a. Half-strength Barrier on Left; Full-strength on Right
b. Full-strength Barrier; Erroneous Influx from East

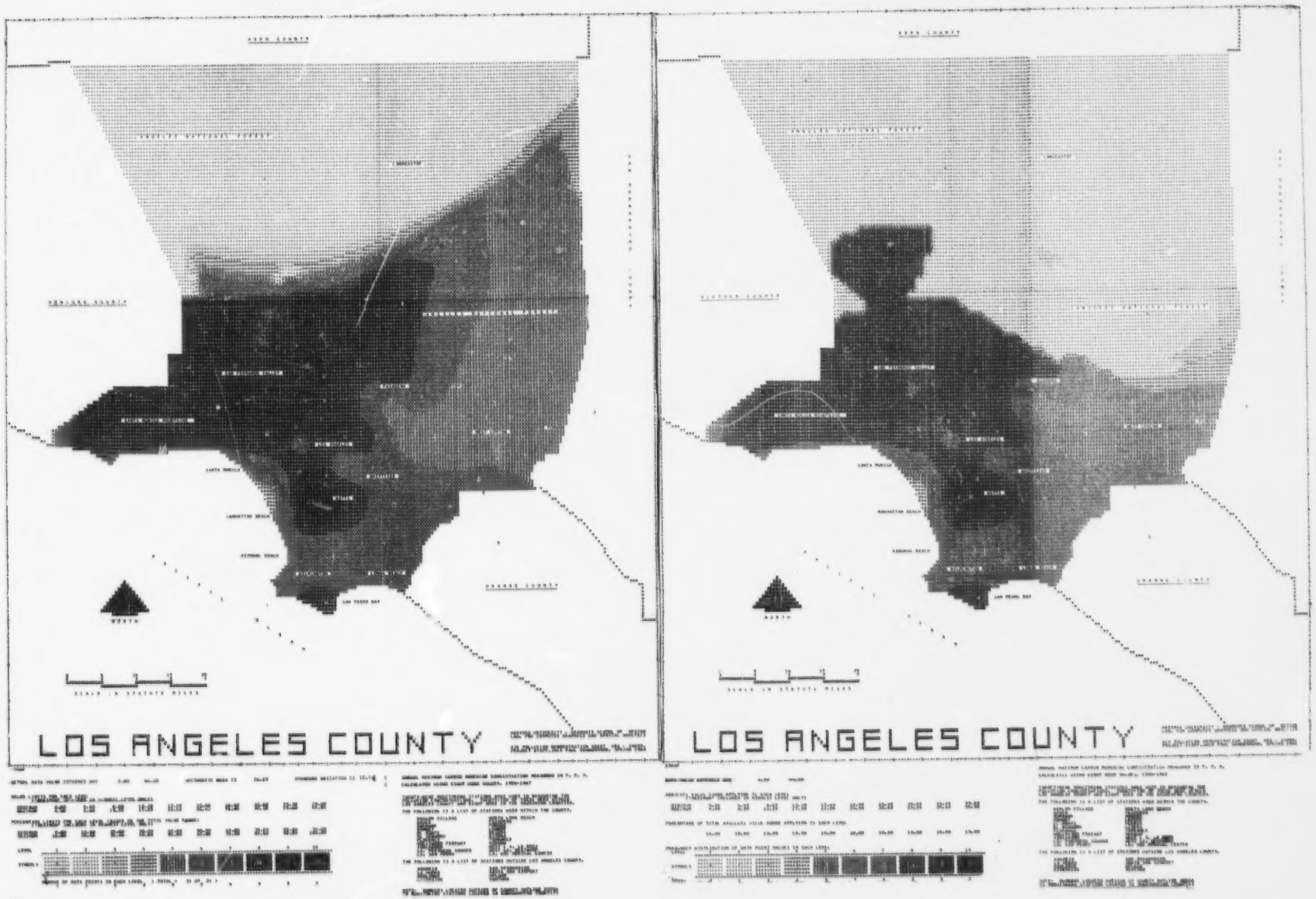


FIGURE I-4

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values 1956-1967
a. 2 Full-strength Barriers
b. Modeling Flow through Mountain Pass

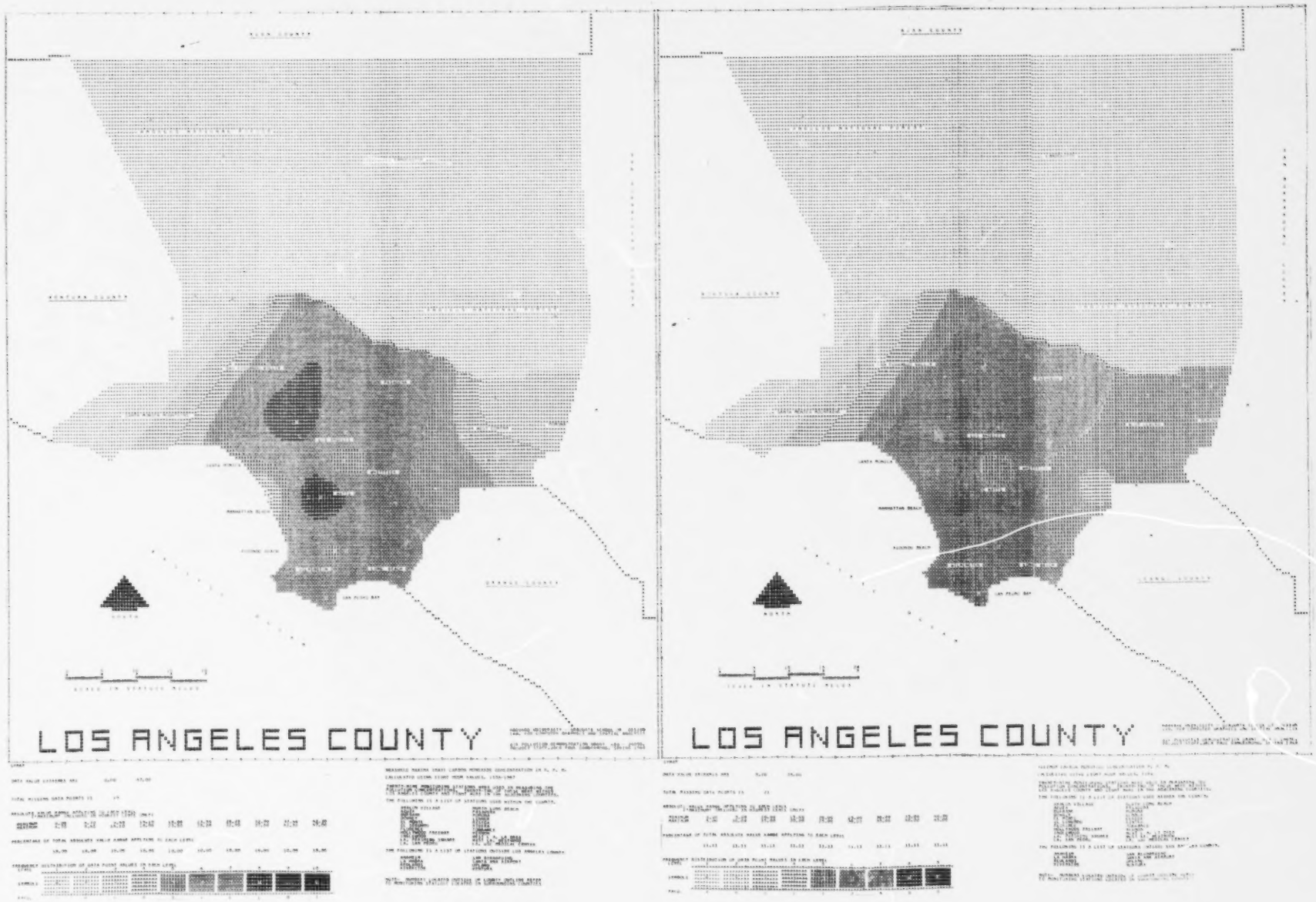


FIGURE I-5

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values
a. 1956-1967 b. 1958

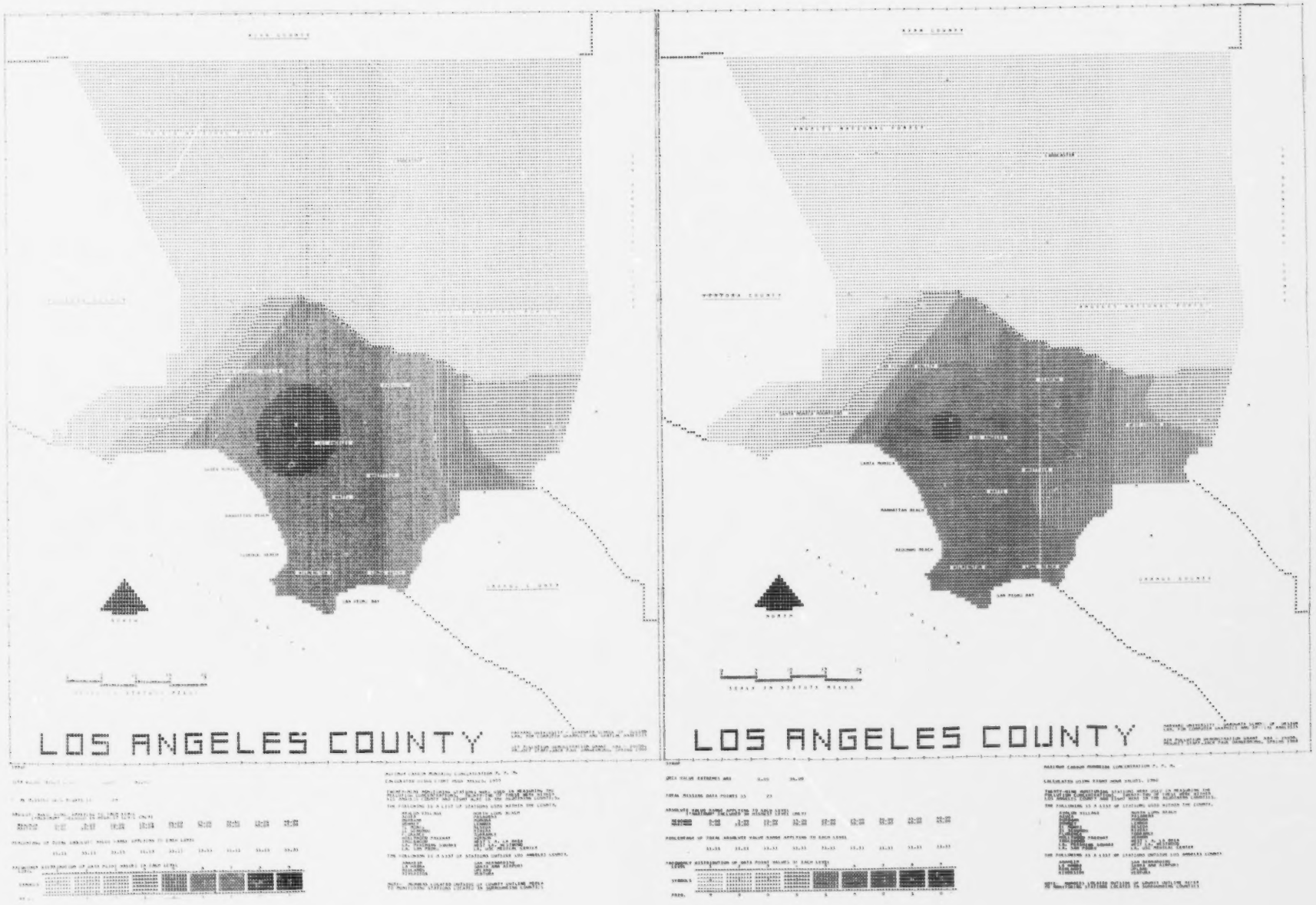


FIGURE I-6

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values
a. 1959 b. 1960

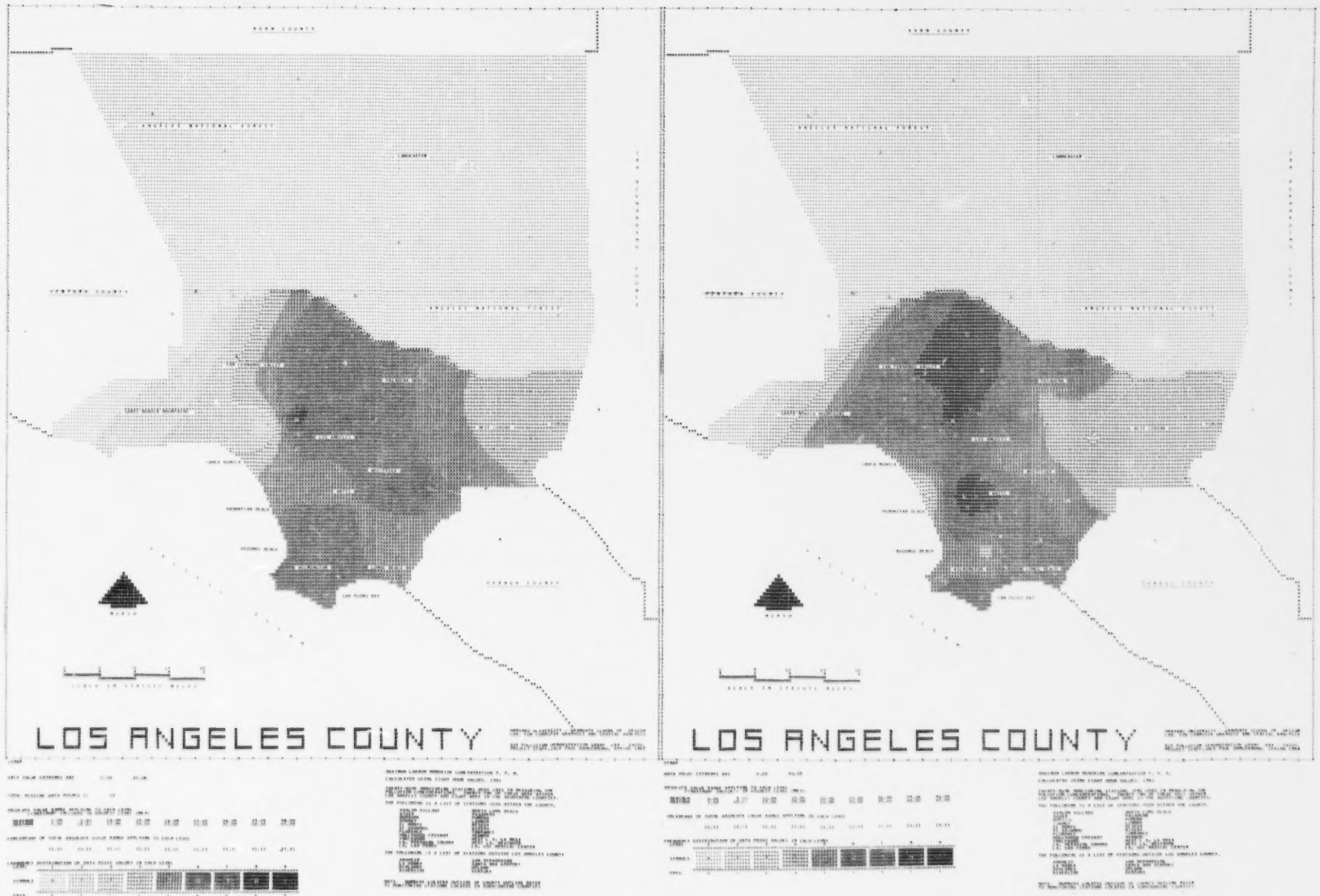


FIGURE I-7

LOS ANGELES COUNTY STUDY
Maximum Carbon Monoxide Concentration
Calculated Using 8-hour Values
a. 1961 b. 1962

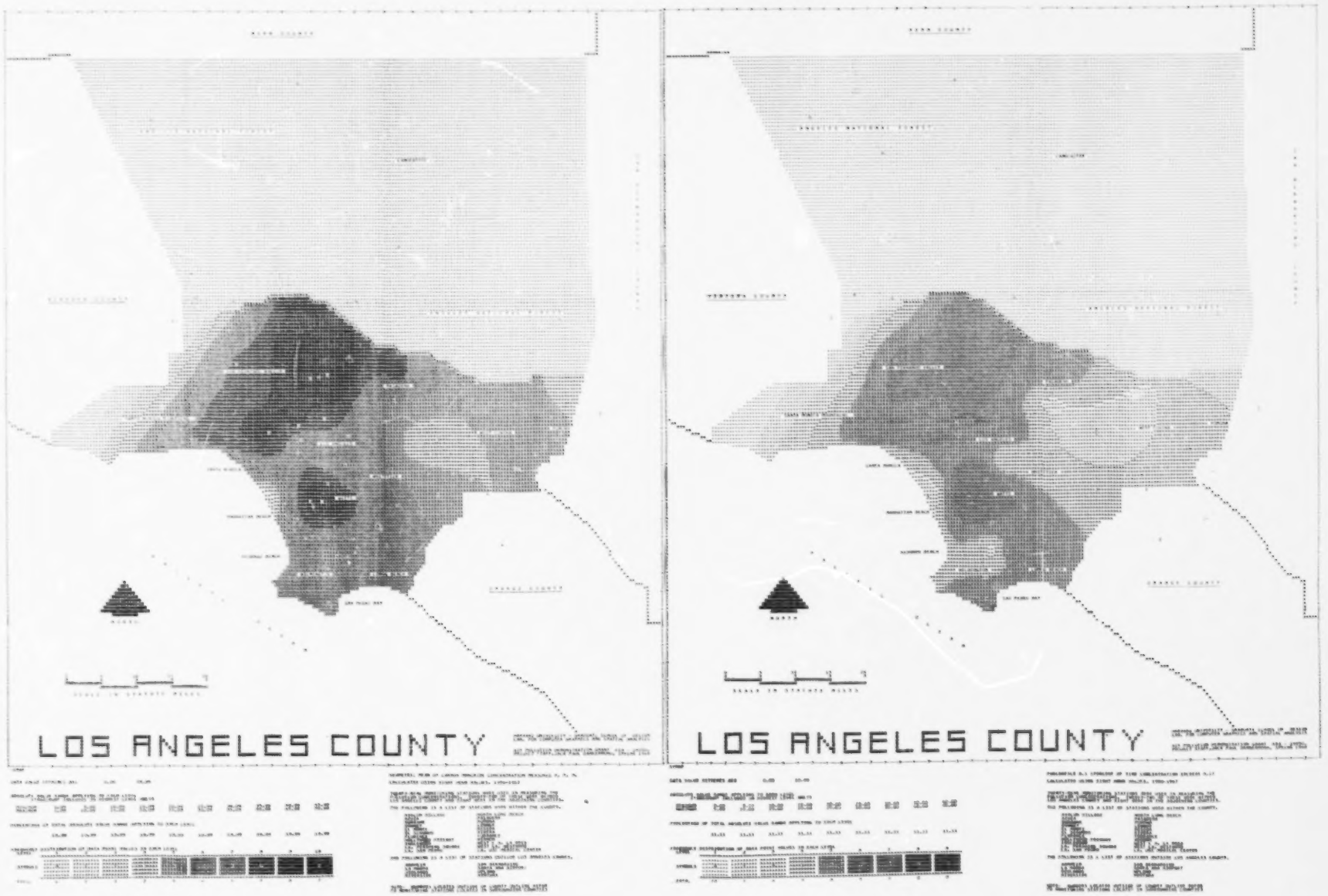


FIGURE I-8

LOS ANGELES COUNTY STUDY
Carbon Monoxide Concentration
Calculated Using 8-hour Values 1956-1967
a. Geometric Mean
b. Percent of Time Concentration Exceeds 0.1 p.p.m.

FIGURE I-9

SAN BERNARDINO COUNTY STUDY
Total Annual Suspended Dust Concentration
1966

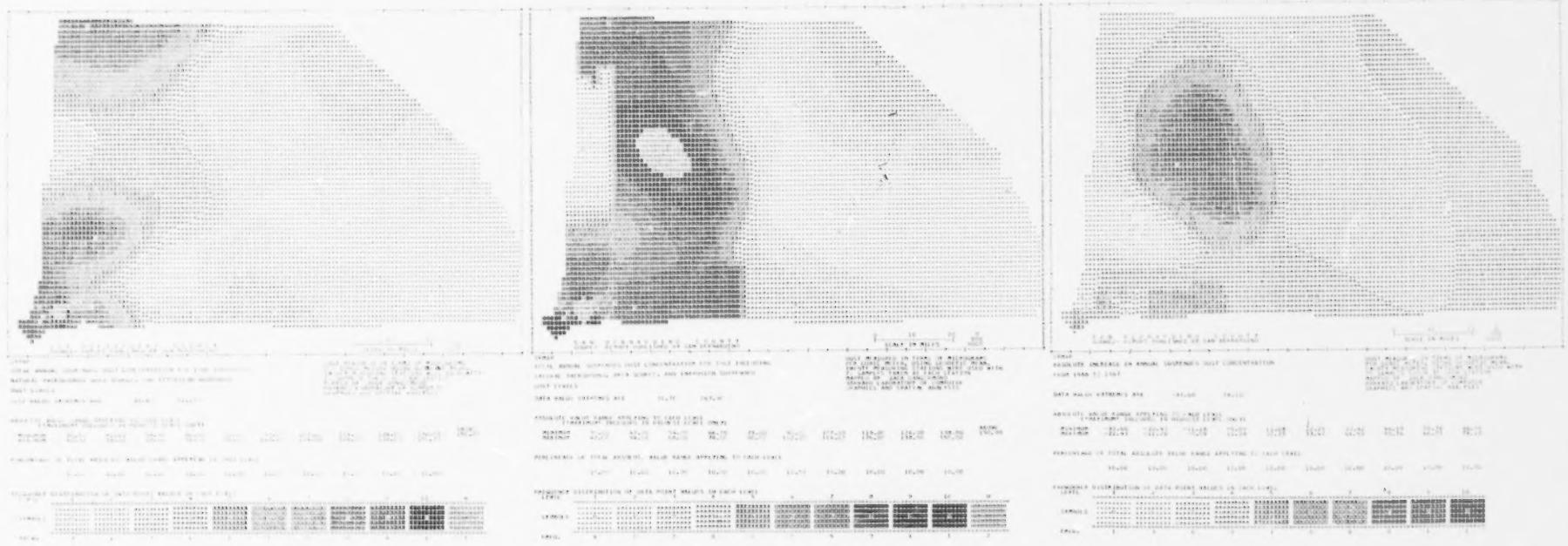


FIGURE I-10

SAN BERNARDINO COUNTY STUDY
Total Annual Suspended Dust Concentration
a. 1966 b. 1967
c. Absolute Increase, 1966 to 1967

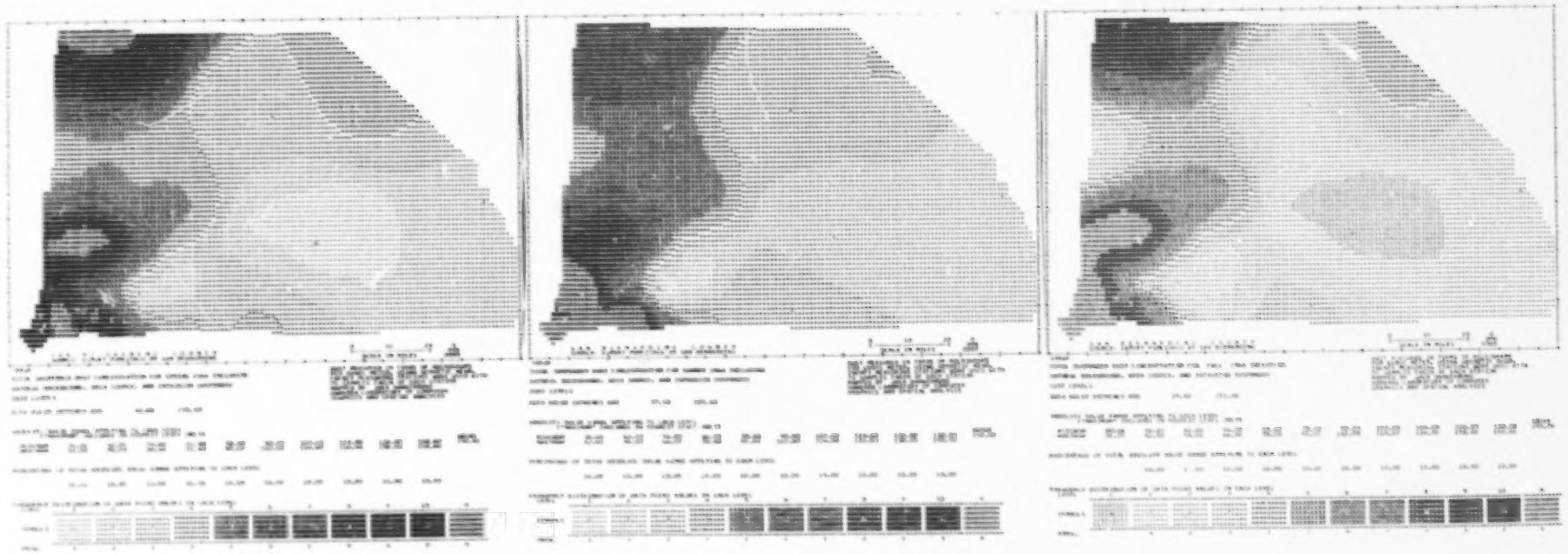


FIGURE I-11

SAN BERNARDINO COUNTY STUDY
Total Annual Suspended Dust Concentration
a. Spring b. Spring c. Fall

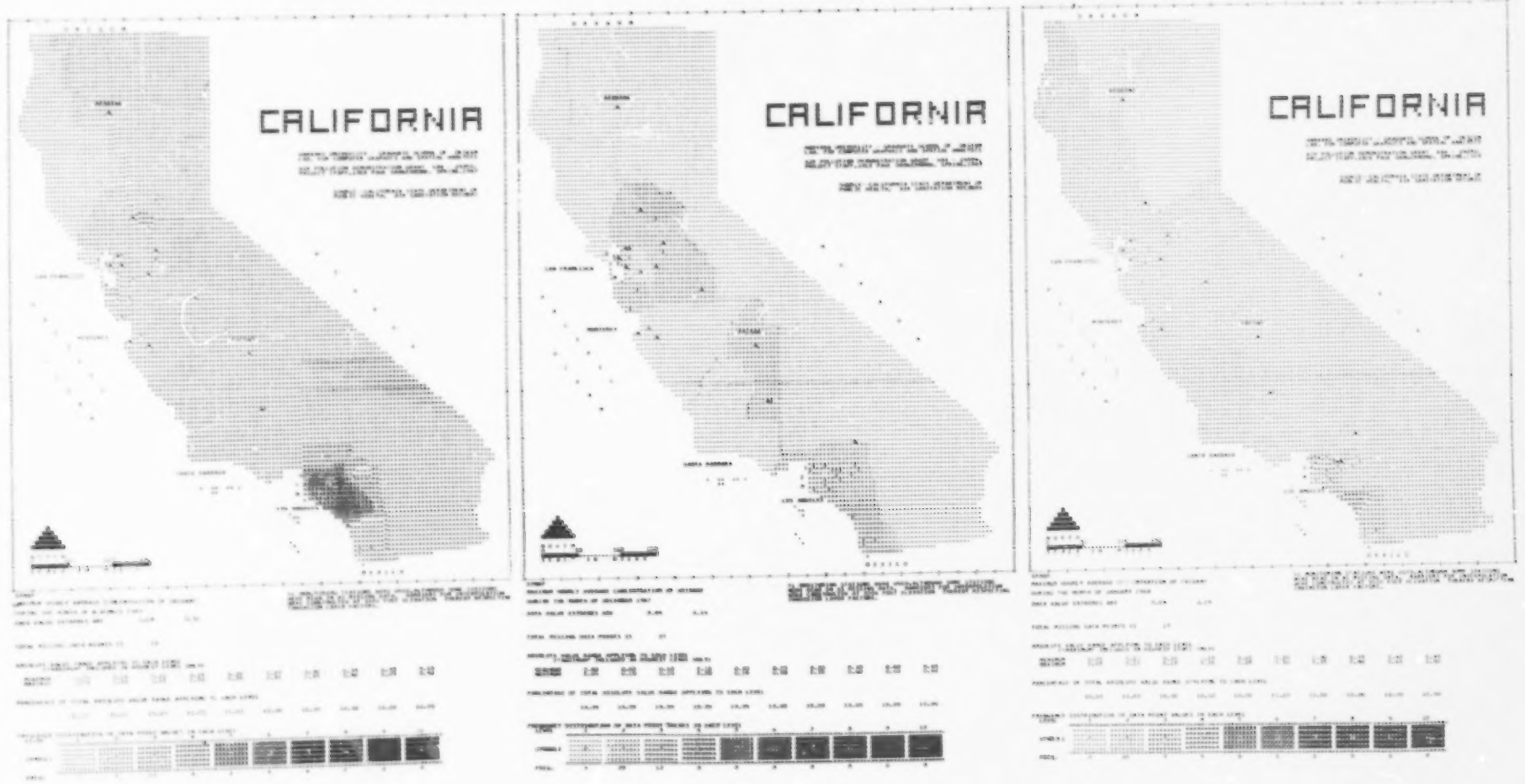


FIGURE I-12

CALIFORNIA STUDY
Maximum Hourly Average Concentration of Oxidant
a. November 1967 b. December 1967 c. January 1968

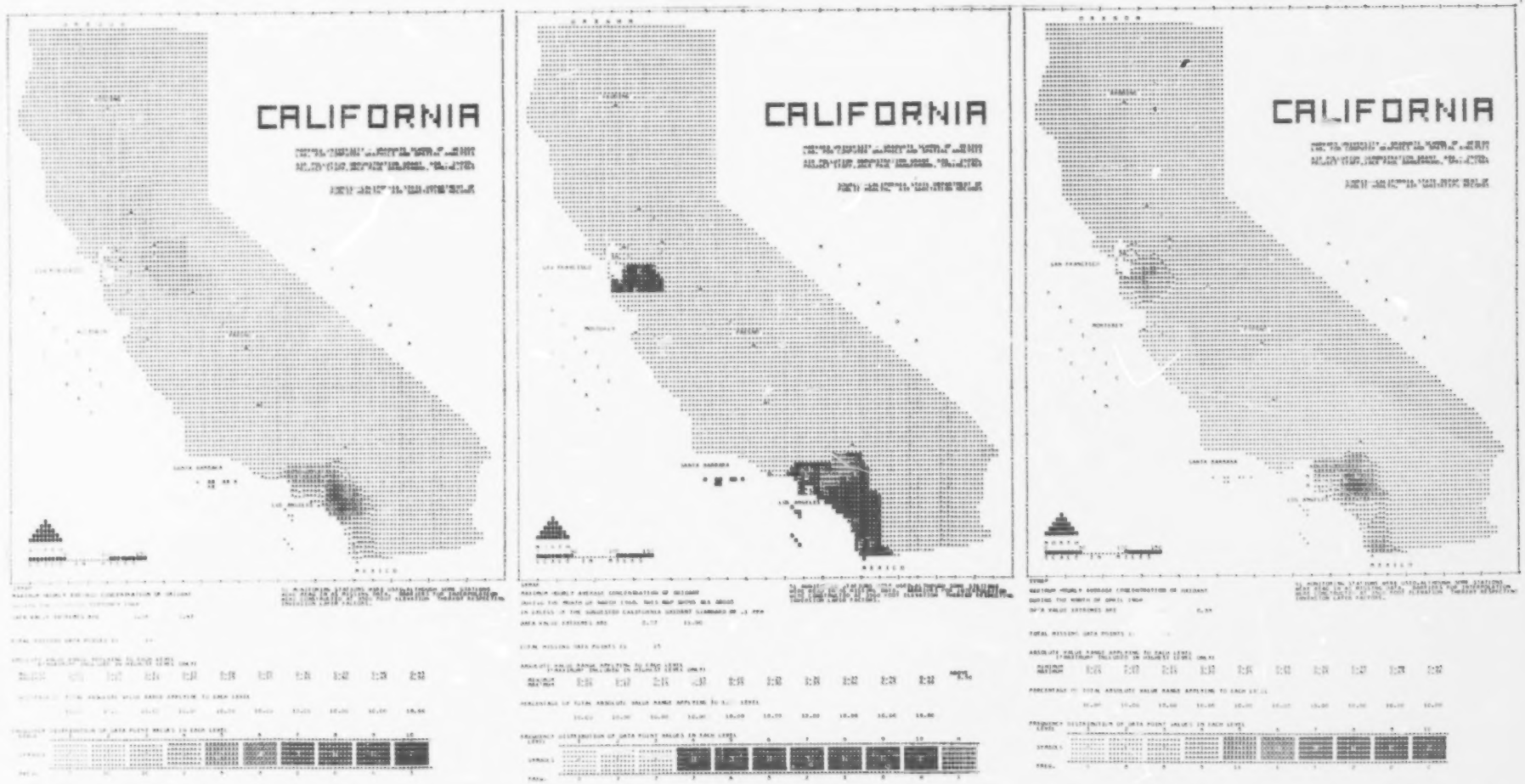


FIGURE I-13

CALIFORNIA STUDY
Maximum Hourly Average Concentration of Oxidant
a. February 1968 b. March 1968 c. April 1968

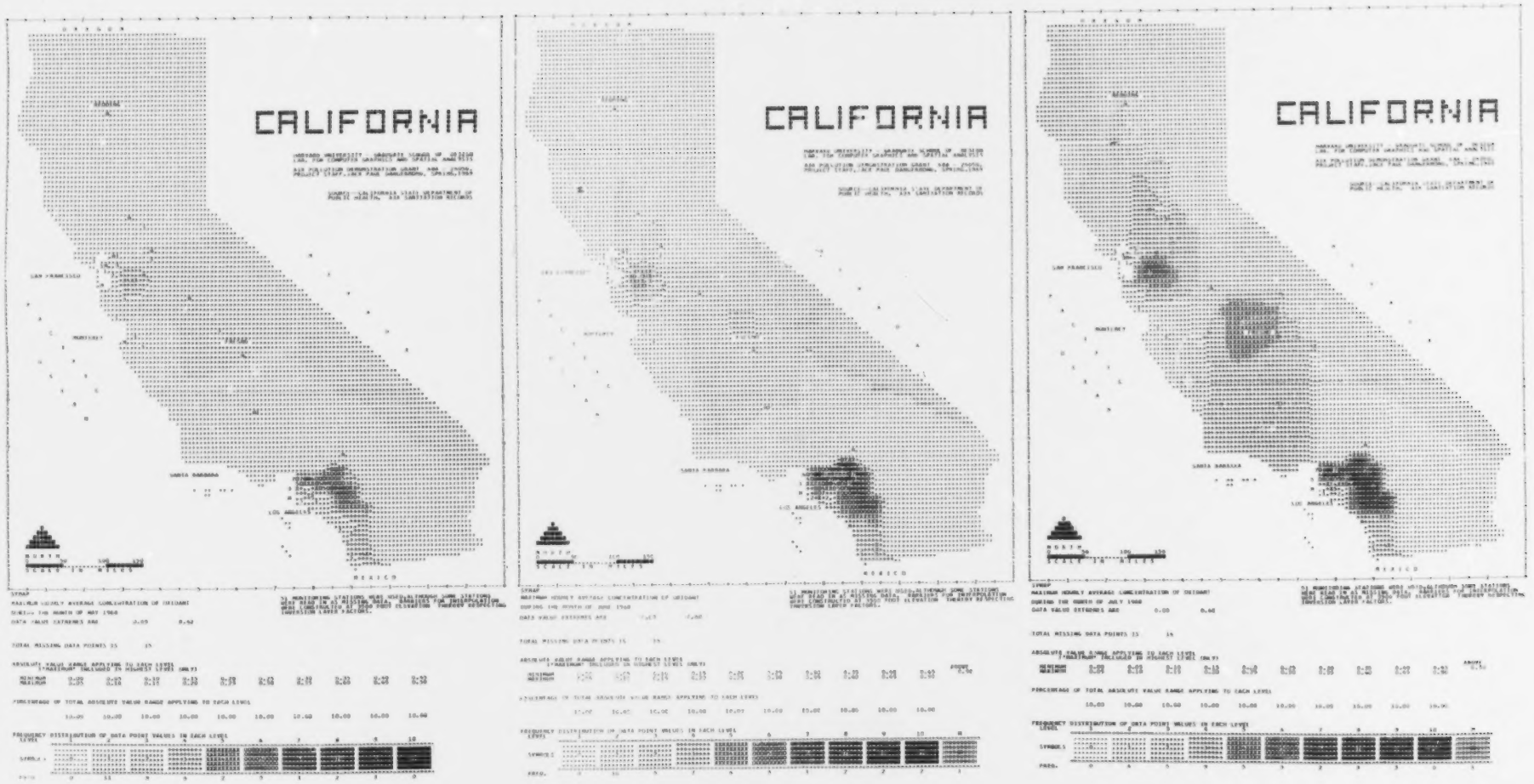


FIGURE I-14

CALIFORNIA STUDY
Maximum Hourly Average Concentration of Oxidant
a. May 1968 b. June 1968 c. July 1968

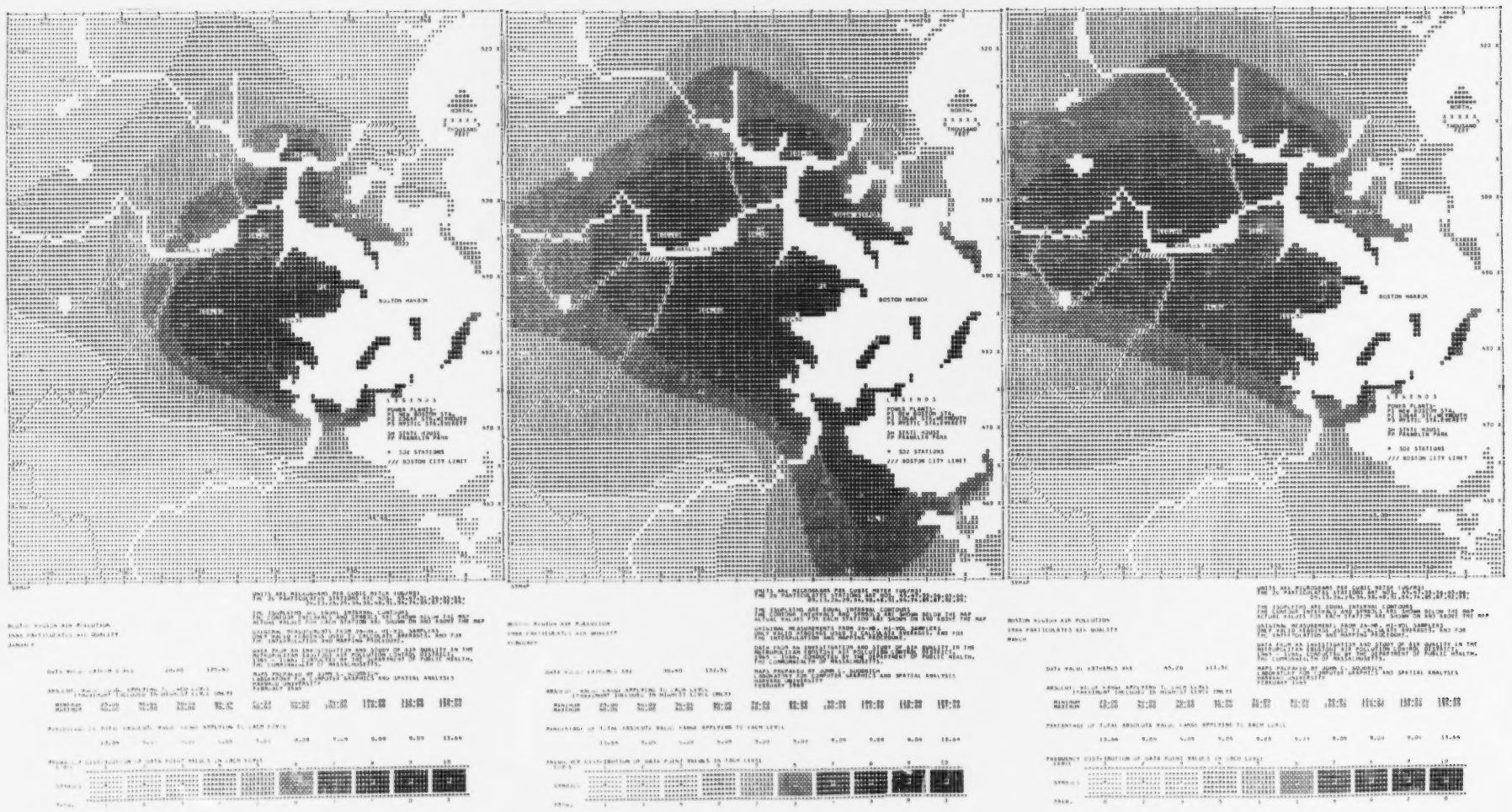


FIGURE J-1

BOSTON REGION STUDY
1966 Concentration of Suspended Particulates
a. January b. February c. March

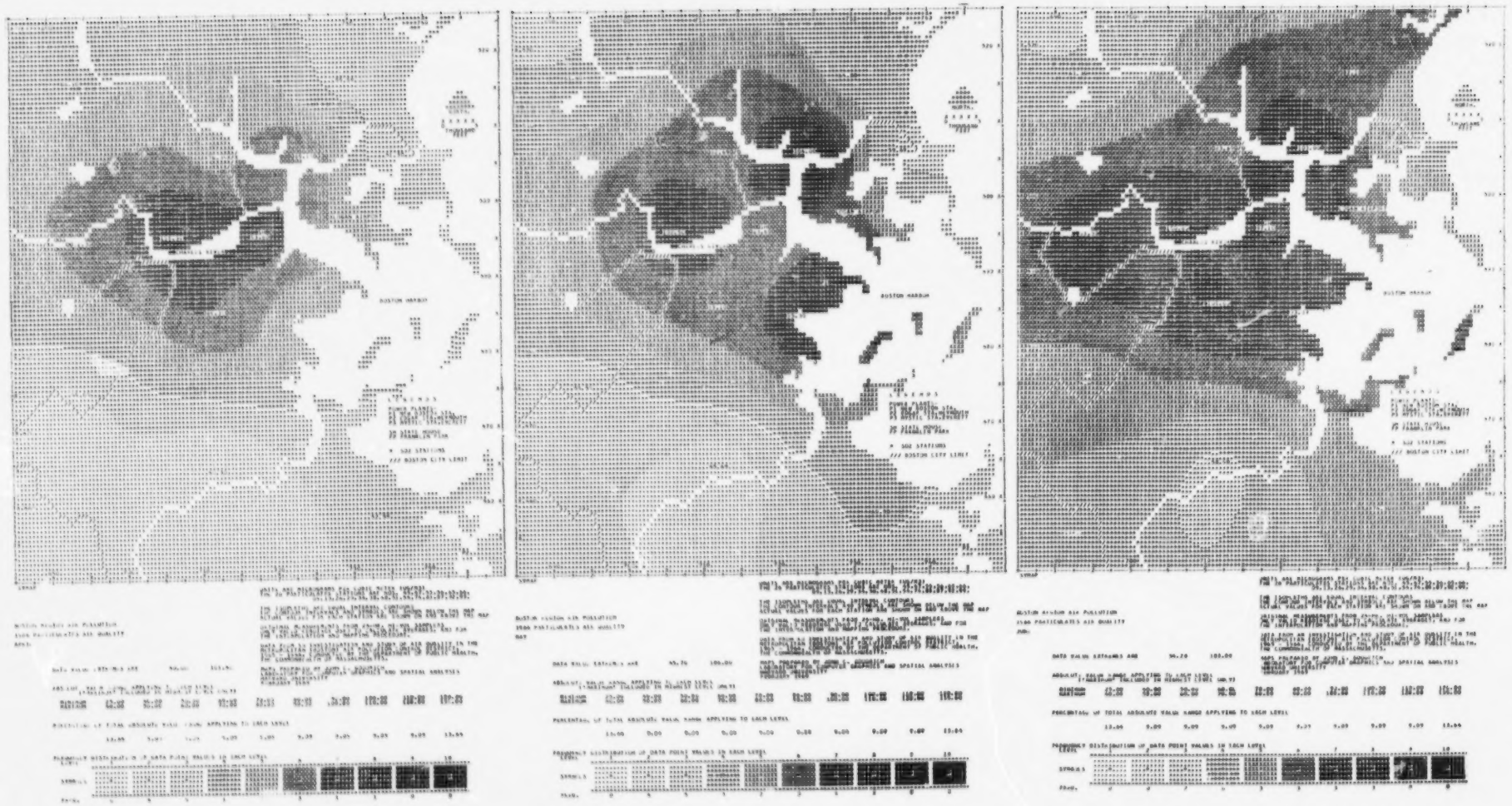


FIGURE J-2
BOSTON REGION STUDY
1966 Concentration of Suspended Particulates
a. April b. May c. June

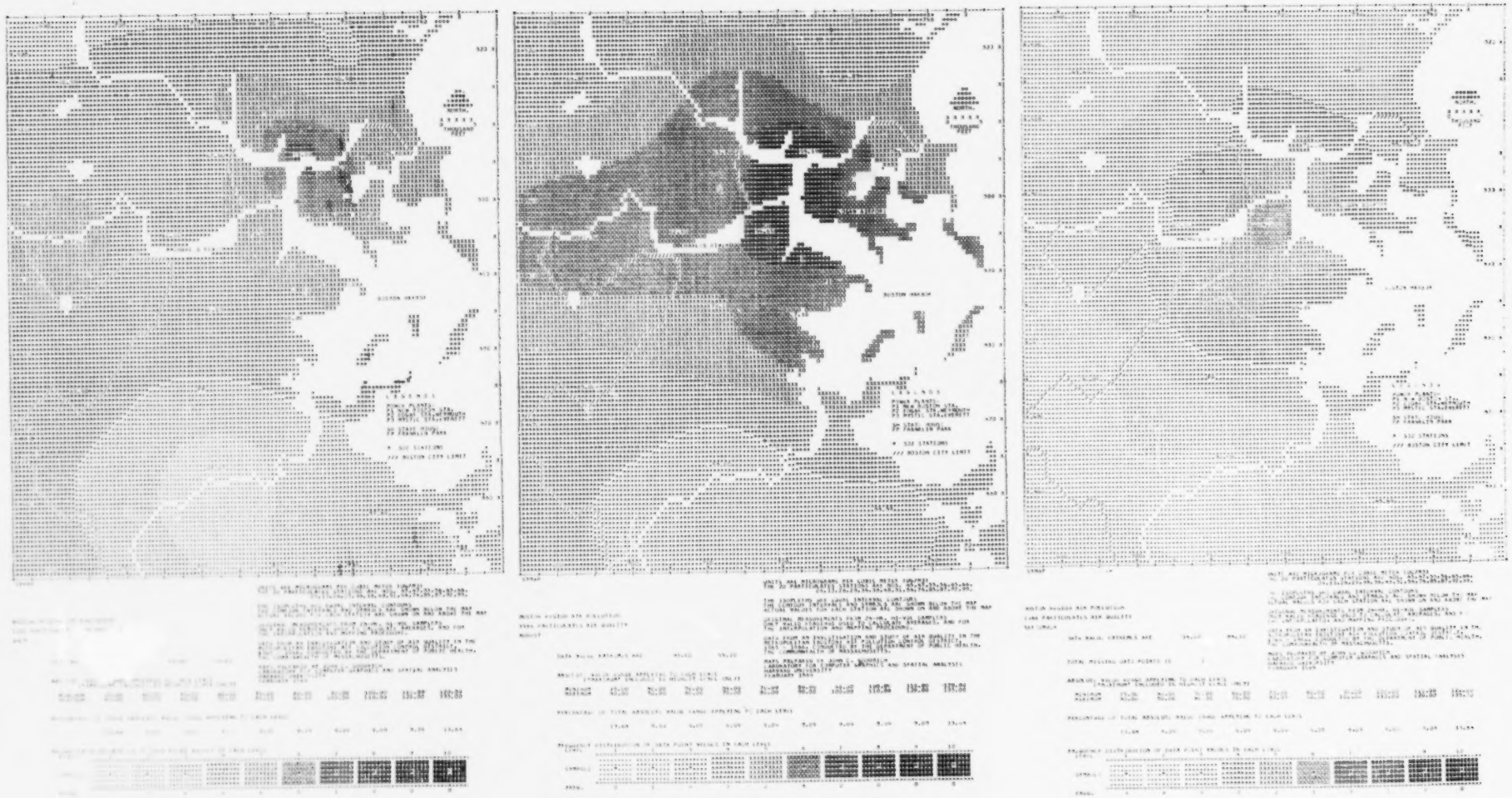


FIGURE J-3

BOSTON REGION STUDY
1966 Concentration of Suspended Particulates
a. July b. August c. September

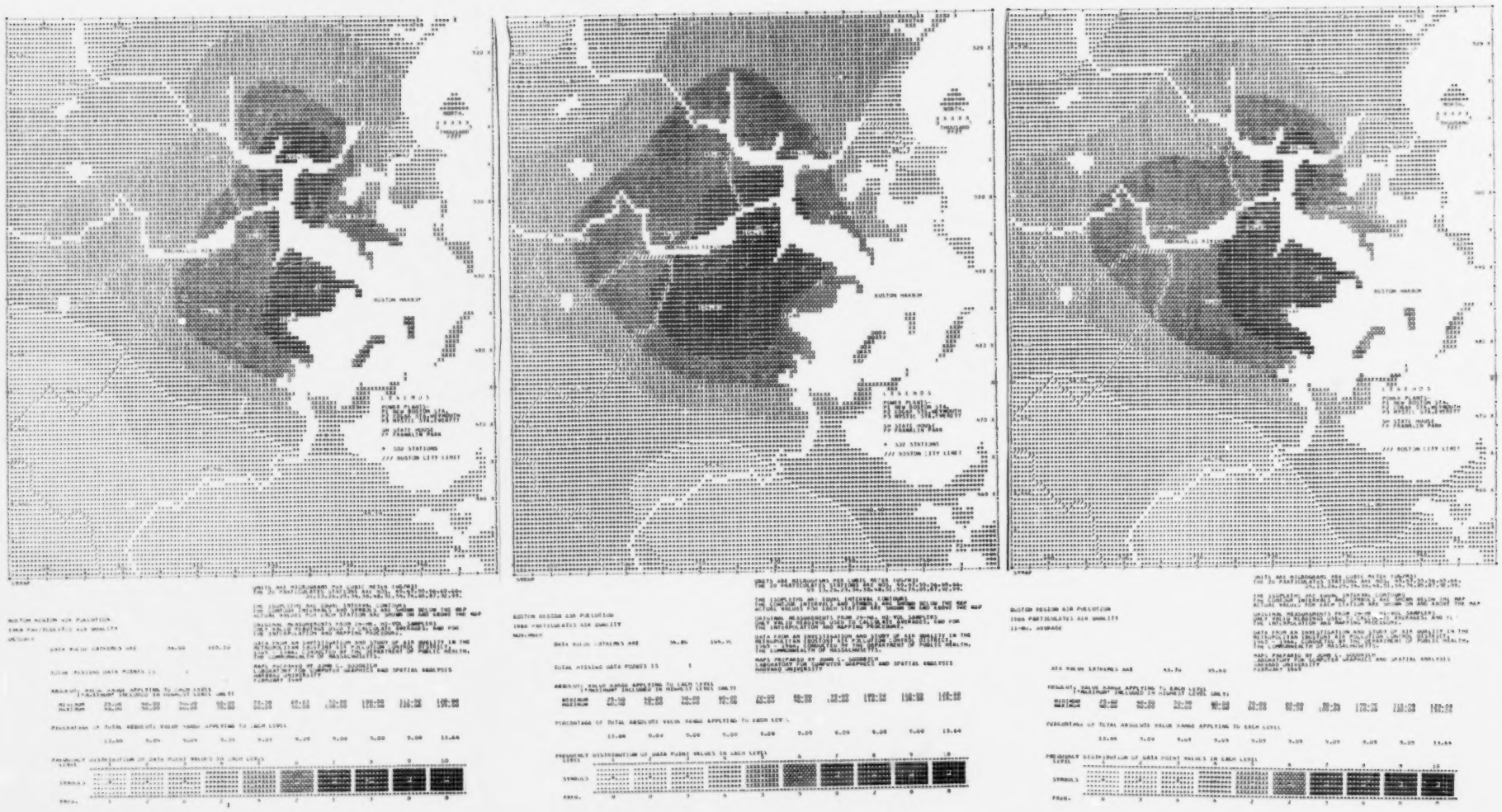


FIGURE J-4

BOSTON REGION STUDY
1966 Concentration of Suspended Particulates
a. October b. November
c. 11-month Average

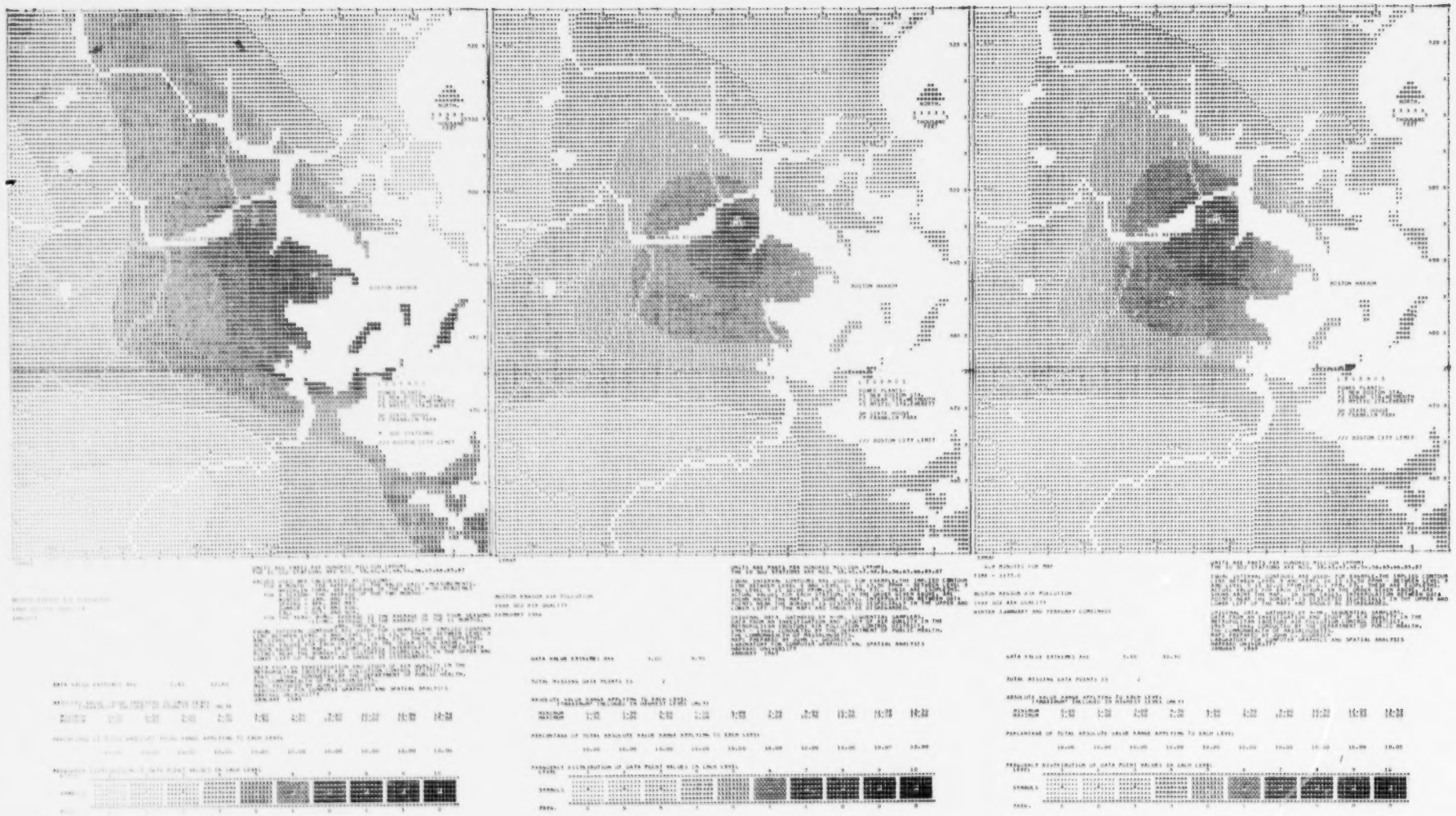


FIGURE J-5

BOSTON REGION STUDY
1966 Concentration of SO_2
a. January b. February
c. Average of a. and b. (Winter)

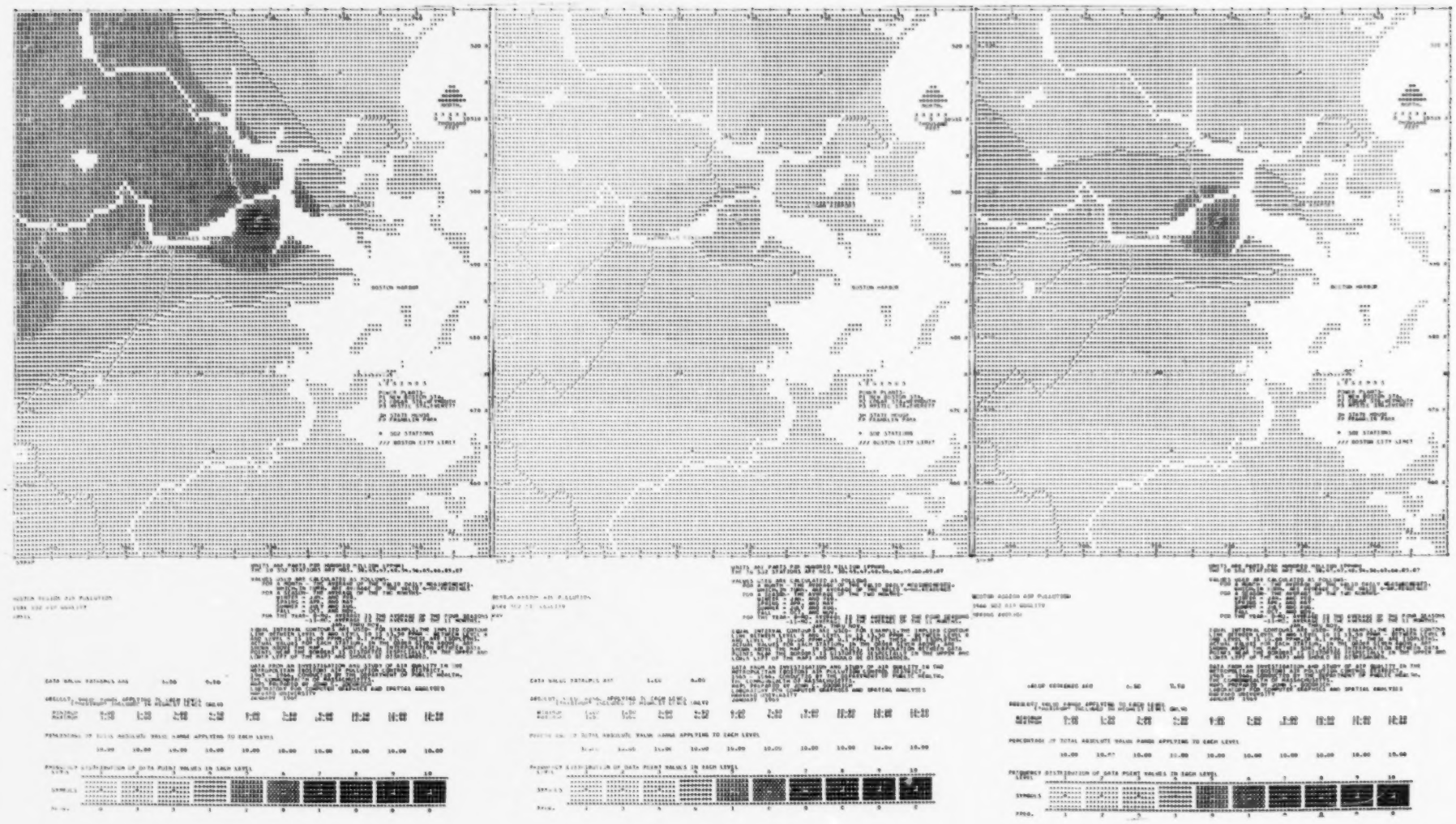


FIGURE J-6

BOSTON REGION STUDY
1966 Concentration of SO_2
a. April b. May
c. Average of a. and b. (Spring)

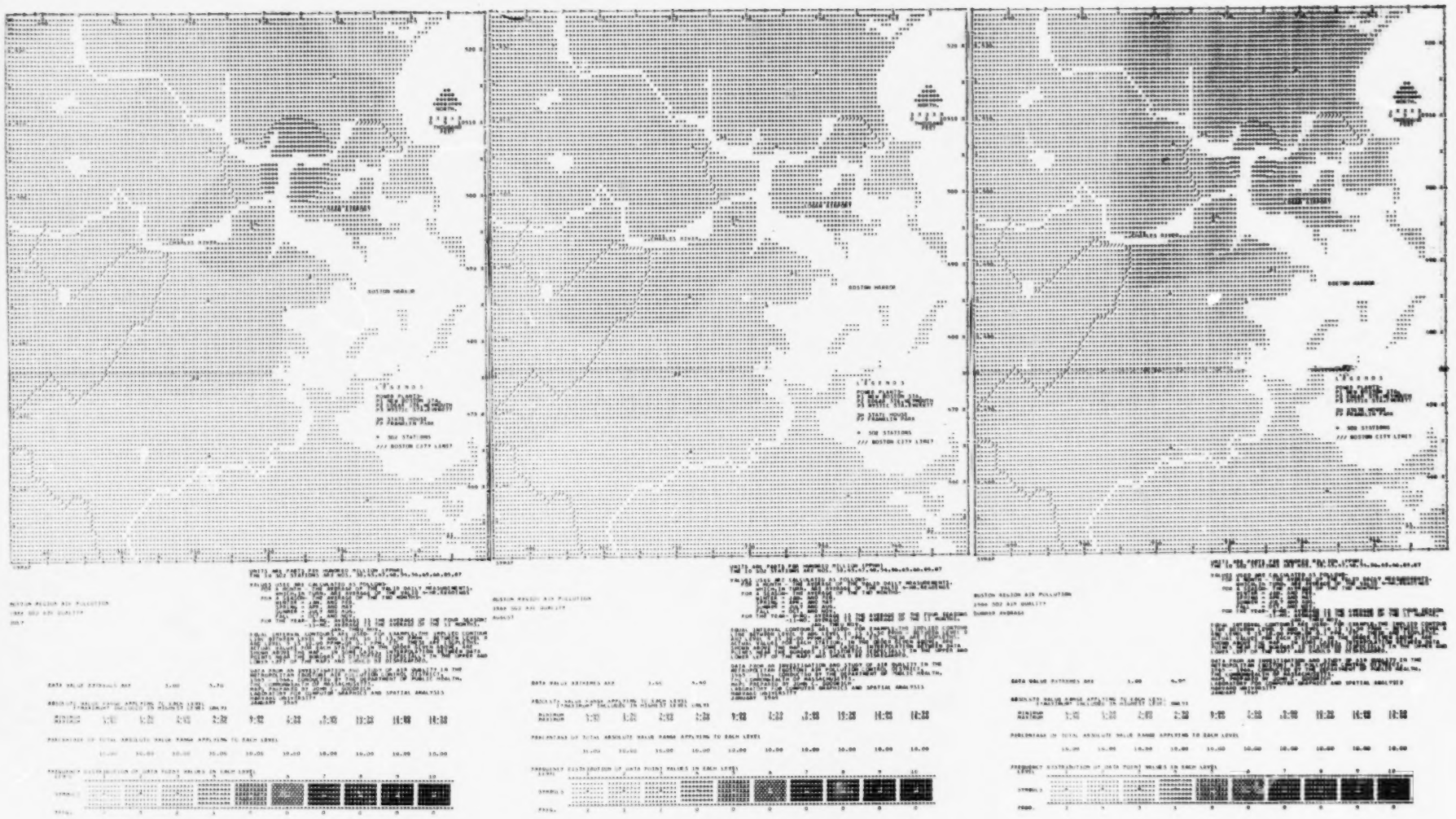


FIGURE J-7

BOSTON REGION STUDY
1966 Concentration of SO_2
a. July b. August
c. Average of a. and b. (Summer)

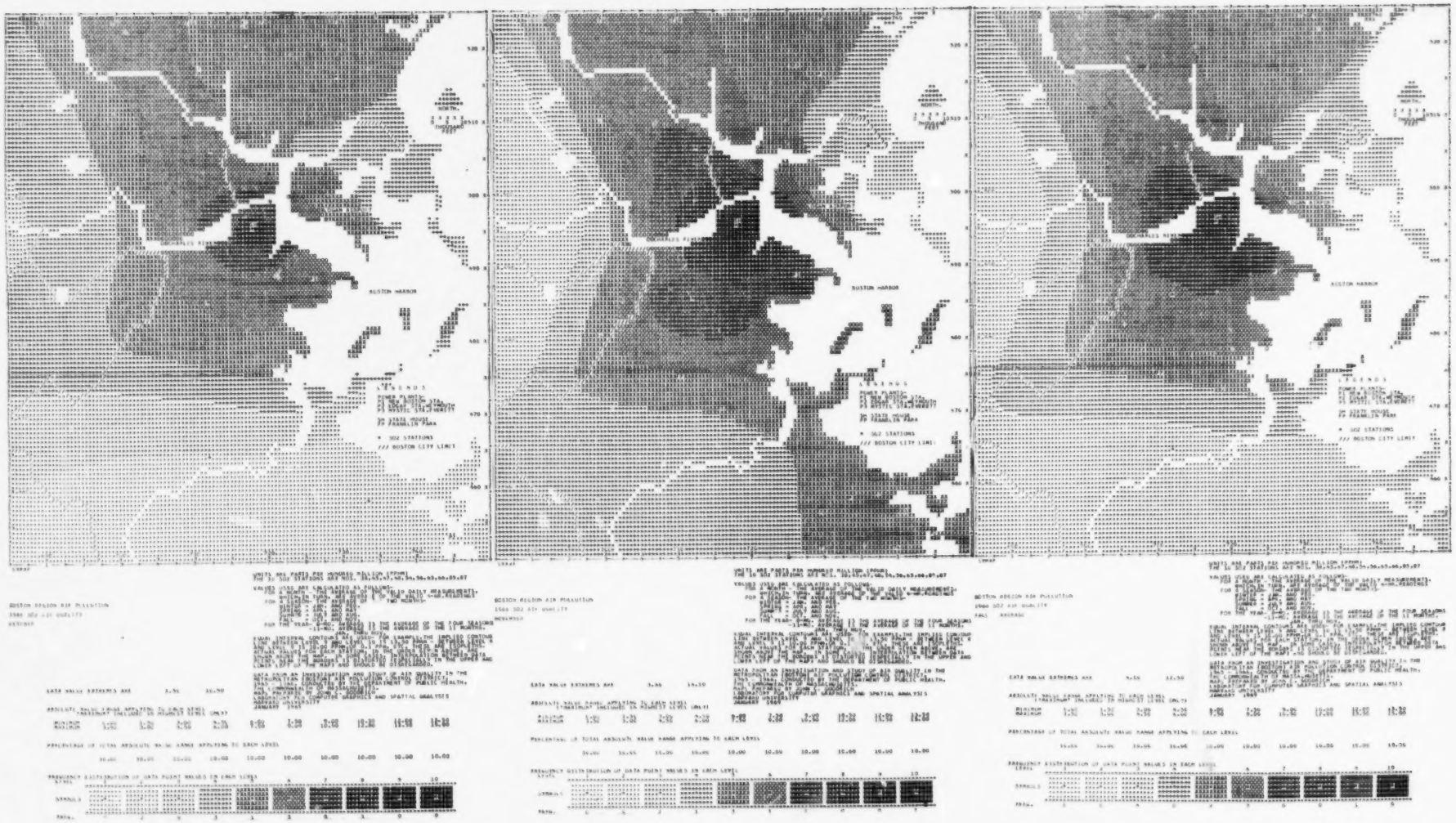


FIGURE J-8

BOSTON REGION STUDY
1966 Concentration of SO_2
a. October b. November
c. Average of a. and b. (Fall)

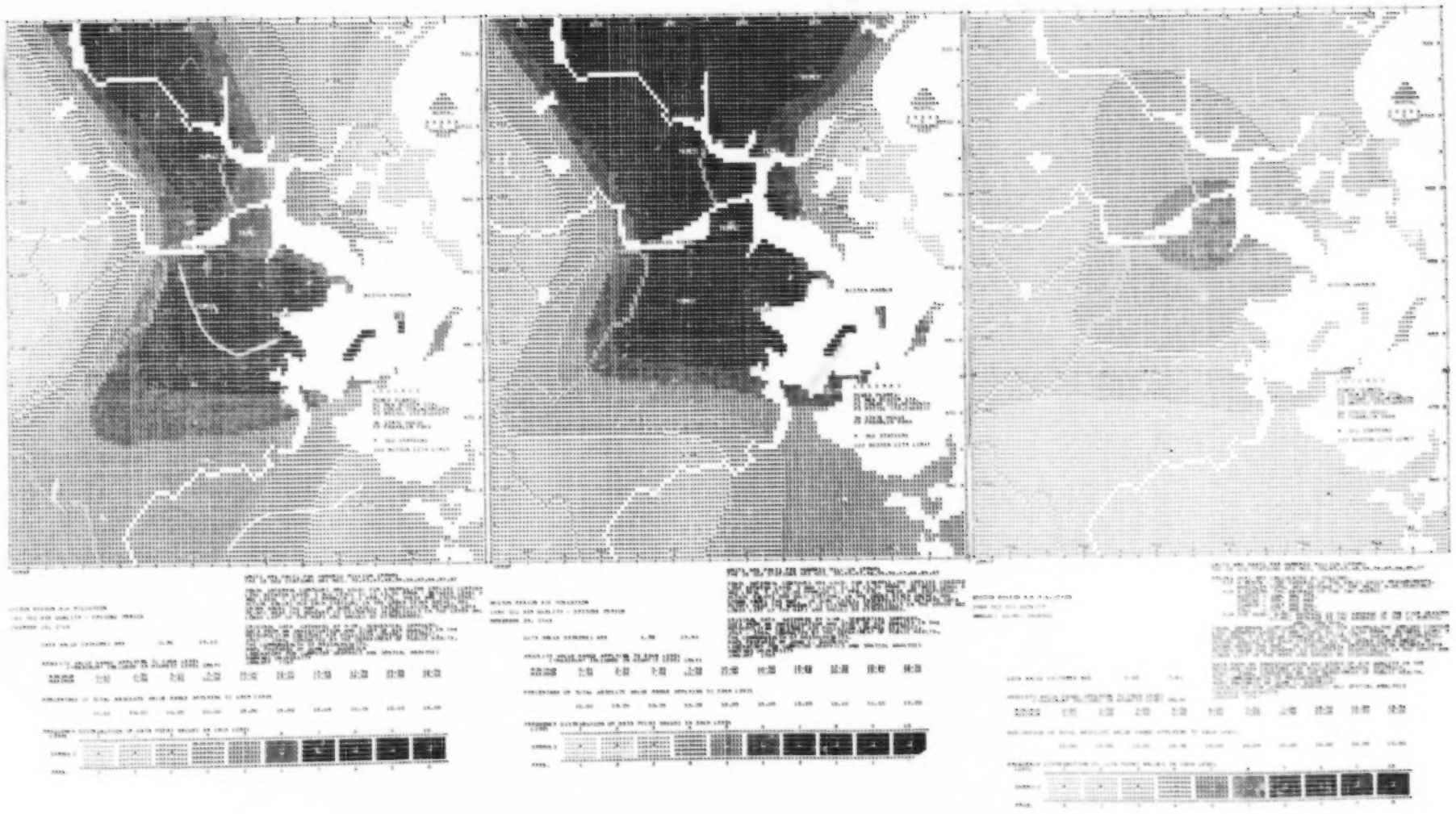


FIGURE J-9

BOSTON REGION STUDY
1966 Concentration of SO_2
a. Episode Period — November 21, 1966
b. Episode Period — November 24, 1966
c. January-November (11-month) Average

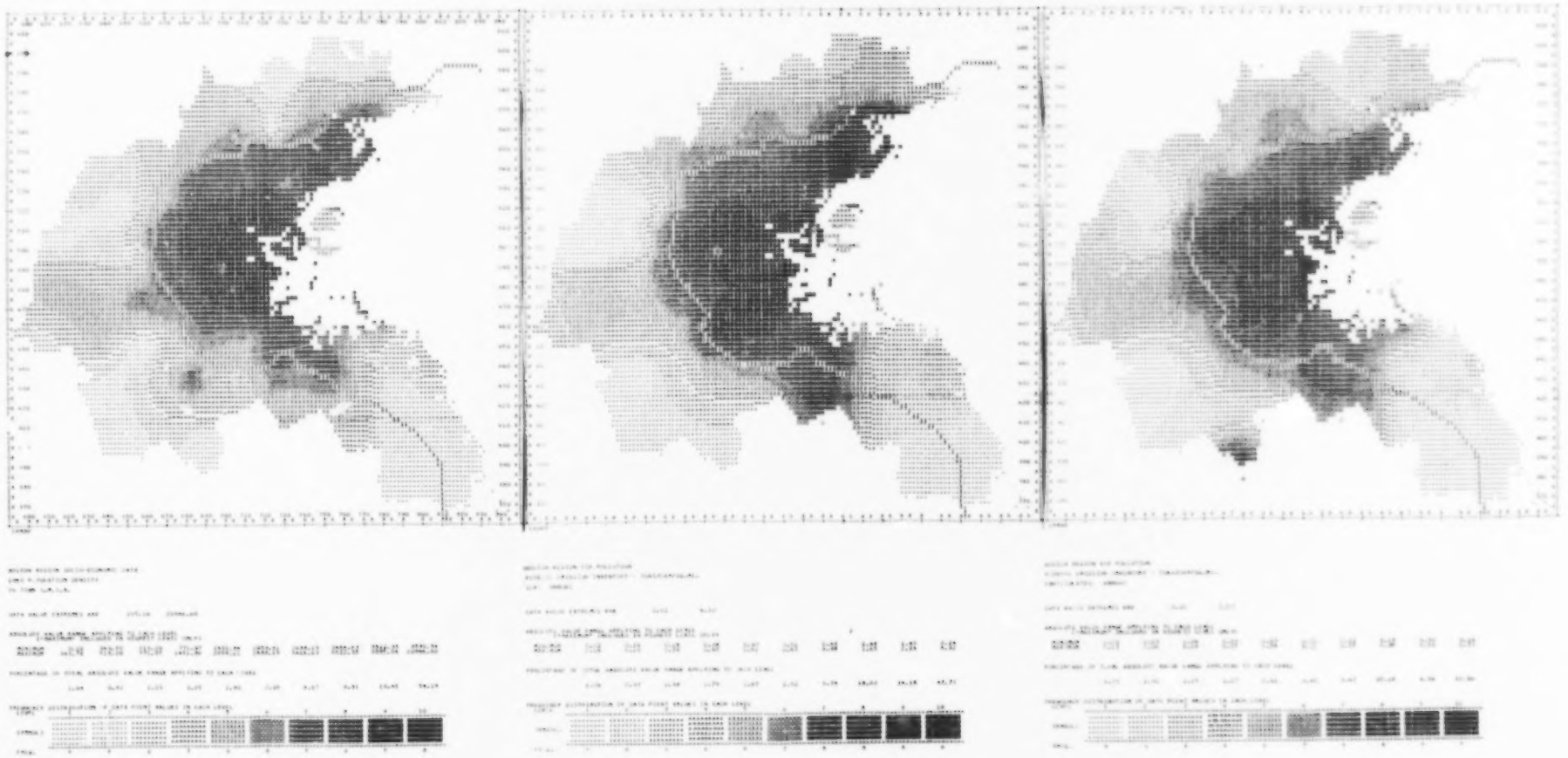


FIGURE J-10

BOSTON REGION STUDY
Development of Emission Inventory
a. Population Density by Towns
b. SOx Emissions, Average Day
c. Suspended Particulate Emissions — Average Day

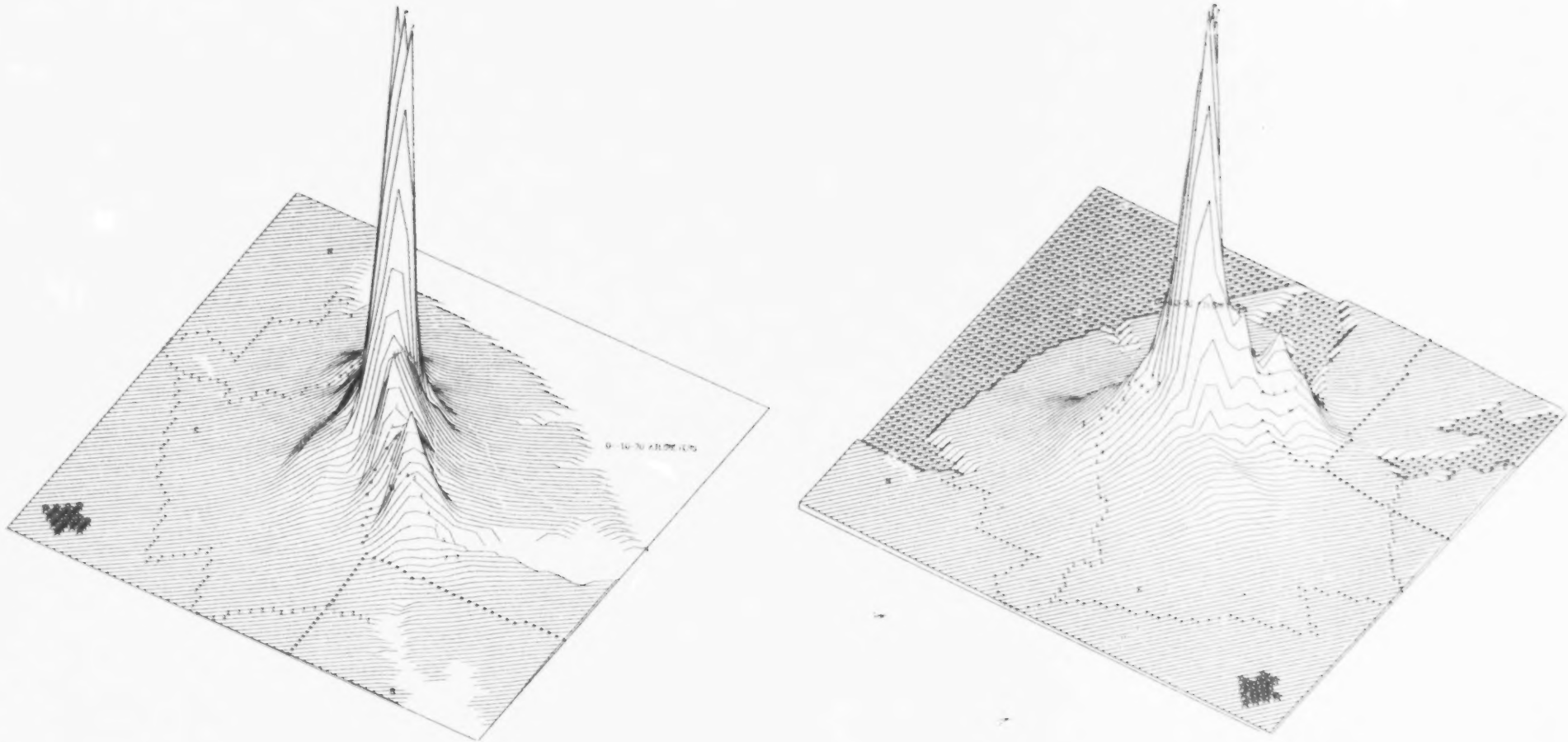


FIGURE X-1

PHILADELPHIA AIR QUALITY CONTROL REGION
Calculated SOx — 12-hour Half-life
Oblique Views 1 and 2 of Surface

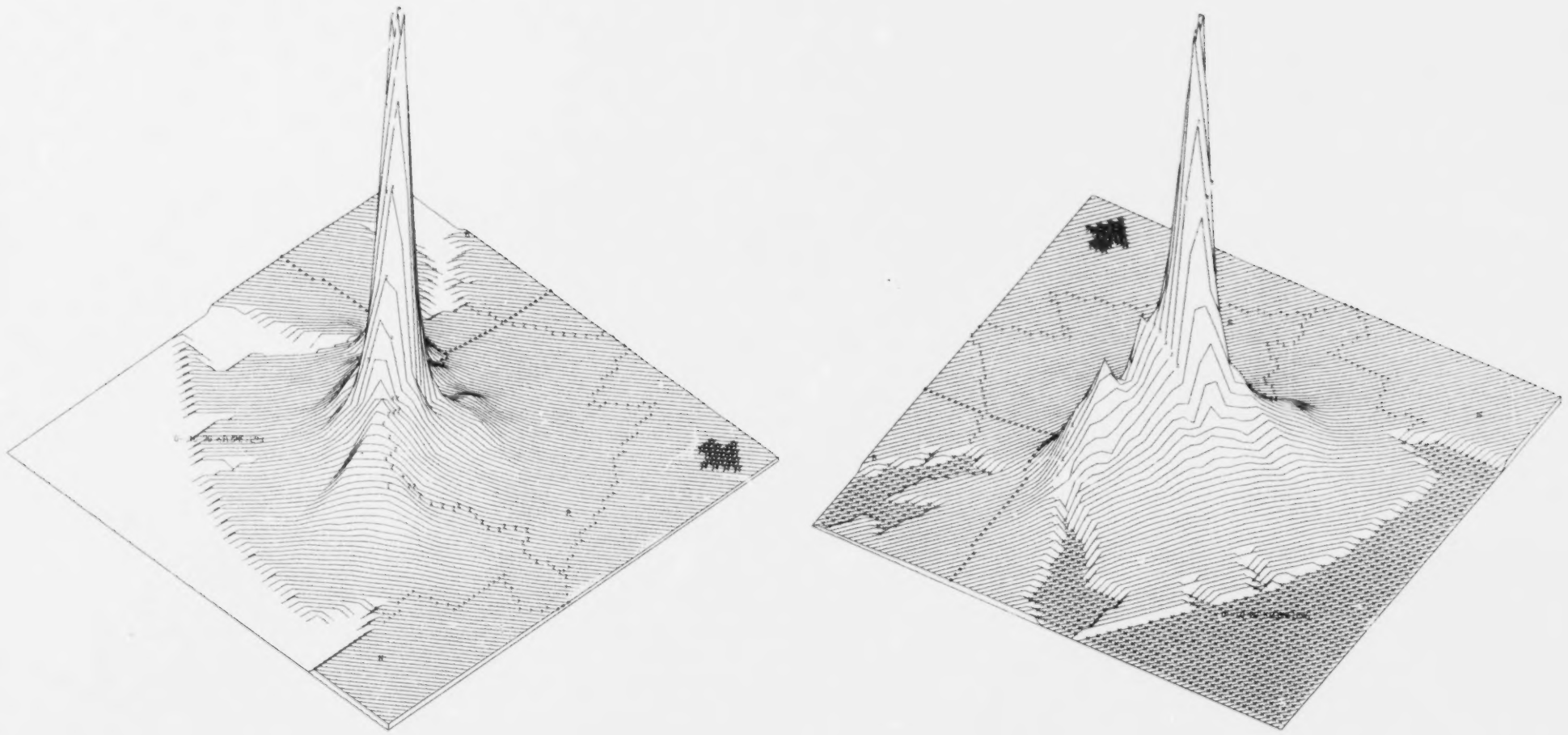


FIGURE X-2

PHILADELPHIA AIR QUALITY CONTROL REGION
Calculated SOx — 12-hour Half-life
Oblique Views 3 and 4 of Surface